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FEBRUARY 12, 1938

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ELECTRICAL WORLD

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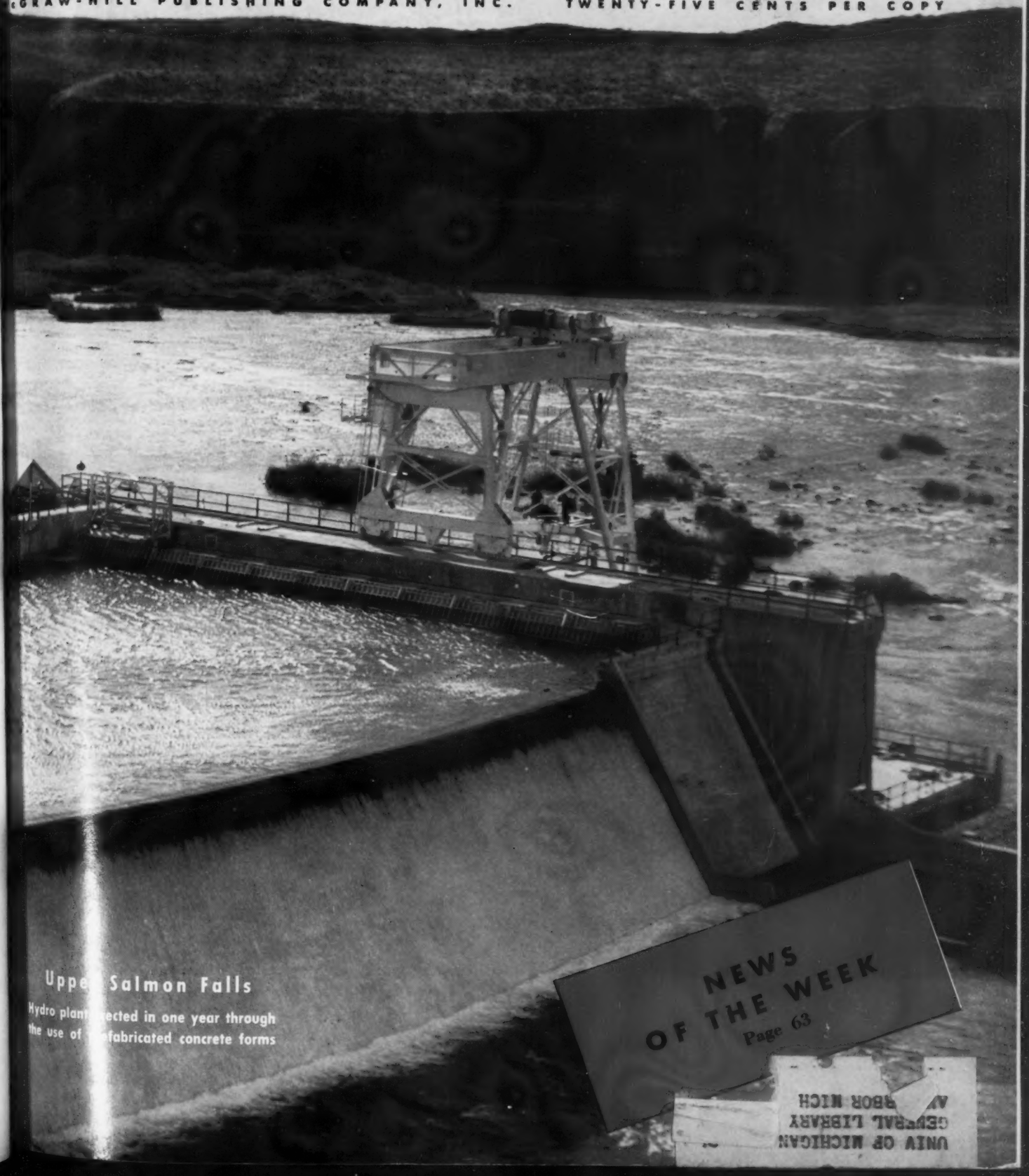

Upper Salmon Falls

Hydro plant erected in one year through the use of prefabricated concrete forms

NEWS OF THE WEEK
Page 63

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RELAYS THAT "Click" IN MODERN CONTROL CIRCUITS

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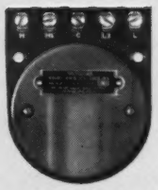

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ELECTRICAL WORLD

FEBRUARY 12, 1938

What Are Minimum Safety Requirements?

Is another National Electrical Code storm impending? The utility program, which has as its object the reduction of the cost of wiring through new and lower cost methods and products, through the elimination of requirements claimed to be too restrictive and through more liberal listing and approved procedure, is bound to meet opposition from certain groups of the industry on the grounds that suggestions now being made would introduce unsafe wiring practices. This allegation the sponsors of the utility program emphatically deny.

The National Electrical Code is a code of minimum requirements fo safeguard the public against fire and accidents from electrical causes. What constitutes minimum requirements for safety? Several times in the past ten to fifteen years we have been warned that the inclusion of certain materials and methods in code regulations would result in a harvest of fires and electrical accidents. But they did not materialize.

While competitive commercial considerations were responsible for much of the agitation, the battle was waged on the grounds of safety without knowledge of what constituted minimum safety. And again today, when bare and covered neutral is seeking code recognition, we are still lacking a definition of minimum safety requirements.

Certain restrictions have been permitted to enter the code and local ordinances which would be difficult to justify on the basis of minimum safety. Irrespective of any superior merit, they should not be made mandatory unless they qualify as minimum. On the other hand, inspectors know from experience that certain specific regulations are necessary. Where the code has been built upon the basis of just such field experiences the mere fact that rules were made necessary by experience should be sufficient to continue their acceptance.

However, such basic experience data are seldom available for new methods even where there has been a period of trial installation, because the latter for several reasons is inconclusive.

What, then, is the answer? Obviously an industry code in which so many different interests are affected must of necessity be in the nature of a compromise, but that does not have to mean a code that prevents the introduction of new materials or methods merely because the business of certain manufacturers will be hurt or because the unit labor will be reduced. At the same time, if the code is to serve a useful purpose, it cannot be a vehicle for promoting the use of products whose only virtue is low cost.

If the foregoing premises are correct, then the remedy would seem to lie in an agreement as to what constitutes minimum safety with due recognition of the hazards of occupancy, skill of labor, degree of inspection, climatic conditions and their effect upon materials and any other factors which experience has shown to have a definite bearing upon safety. When such basic principles have been determined and have been approved by all of the groups that have an interest in the code, it will be found that the introduction of new methods and materials and code revisions will be secured with much less confused thinking.

What are the alternatives? One is a lessening of the influence of the code (1) through the bootlegging of unrecognized materials, (2) through an ever-increasing number of special local rules that are more restrictive, and (3) through the substitution of locally written codes. Another alternative is a new code by some government agency such as the Bureau of Standards, which is what organized labor and certain municipal inspectors would like to see.

No matter how much the utility group might believe that its program would result in more adequate wiring, more business for contractors, wholesalers and manufacturers, more work for labor, dissension at this time would only weaken the influence of the code. More progress might be made in the long run if the efforts of all concerned were concentrated in a mutual determination of basic principles which would be a guide for future code revisions.

Practical Measures Keynote

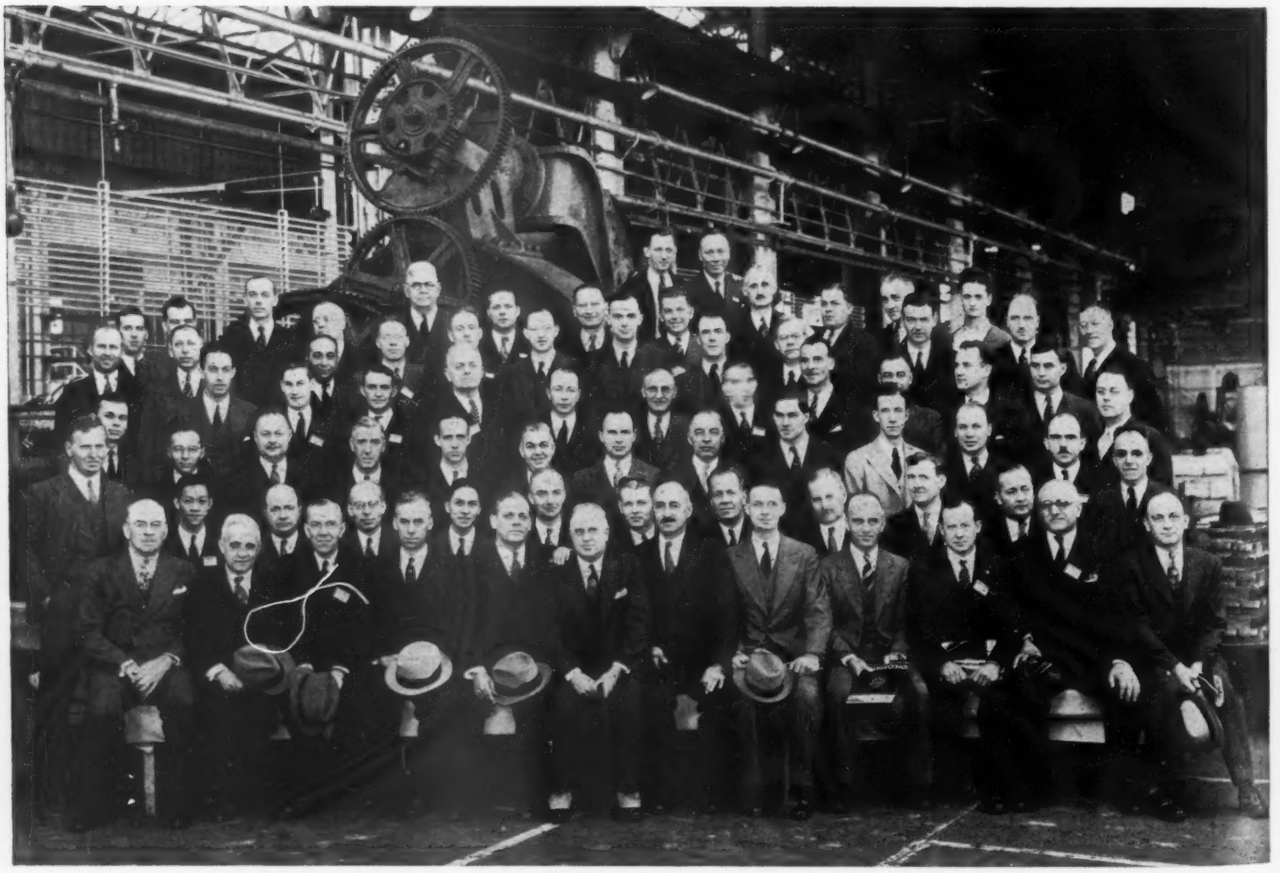
Petersen coils viewed with favor as surge relief
Network analyzers conserve capital and avert planning errors
More adoption of carrier relaying seen

AN unusually high fraction of practical discussion of the industry's problems marked the recent four-day technical sessions of the American Institute of Electrical Engineers in New York. Testimony substantiated the value of a.c. calculating boards as indispensable tools of power system planning for minimum outlay and best performance. Electrical transportation recorded an optimistic determination to survive and succeed economically with the bulk of the load carried by central stations. Progress was made toward unified rating of welding transformers.

Current-carrying capacity of rubber-insulated conductors in extended tests shows the N.E.C. needs to take more cognizance of the inadequacy of present provisions. The carrier principle for relaying and communication showed gain in favor of this wire-saving technique. Resort to vacuum filling was

Engineers use Friday exclusively for plant visits

This group was shown about the Okonite-Callender Cable plant at Passaic, N. J. The machine in the background is one of the largest cabling machines.



Technical Sessions of A.I.E.E.

Current-carrying capacities due for revision
Electric transportation has confirmed future as utility load
Ratings proposed for welding transformers

offered as an escape from failures due to entrapped air in transformers. The solid forms of distribution transformer interconnection seem to give a gain in performance of fuses, arresters and burnouts. Design data were given to show how wood can be used advantageously to augment porcelain insulation in transmission structures. And as a final high point of practicality in the deliberations a growing sentiment in favor of Petersen coils for relief of surges was recorded and promise given of many American installations.

Petersen coils gaining favor

PETERSEN COILS are on the ascendency here after some 20 years of extensive use abroad. Since the first installation here in 1921 there have been only seventeen total installations, while the rest of the world had engaged in 1,700 installations. E. M. Hunter (General Electric) reported that our operating companies are contemplating more of them because they are proving a simple and relatively inexpensive means for eliminating short-circuit currents and service interruptions from ground faults and transition flashovers. By their use it may be possible to clear 70 to 80 per cent of all faults without breaker opening and with improved stability. That the day is near when power systems will take "mild treatments rather than undergo major operations for indigestion" was the expressed belief of H. P. Sleeper (Public Service E. & G. Co.). The trend is toward fault relief and away from fault disconnection; some now unestablished combination of prevailing and unknown methods will in the next five or ten years greatly mitigate interruptions, and in his opinion the Petersen coil may well become more prominent as one of the remedial measures.

Study of European practice by R. E. Hellmund (Westinghouse) tempered the enthusiasm for Petersen coils reflected at the 1937 Paris high-tension conference because of added expense of insulating tap-changing transformers from ground and also because lightning abroad is more disastrous due to less favorable line constants there. Further, insulation levels are generally lower than ours.

With no disposition to derogate the effectiveness of the Petersen coil, J. R. North (Commonwealth & Southern) did feel that some of the assertions in Hunter's paper should be qualified on the basis that they do not eliminate overvoltage, but rather control its consequences. Further, it is only the quadrature components of fault current that are neutralized by the tuned coil and it is the in-phase component which largely determines the success or failure of the installation. System-charging currents can be computed within 10 per cent if proper allowances are made for local dissymmetries due to loop or radial configuration, the line concentrations at buses, substation structure and pole factors, and the consequences of the associated relaying scheme.

Economic virtue of Petersen coils on cable systems was questioned by Herman Halperin (Commonwealth Edison), but Hunter said they permit several hours' operation under fault conditions until repairs can be most conveniently made.

Studies on the Colorado 100-kv. installation (ELECTRICAL WORLD, September 11, 1937) reported by Hardaway (Public Service of Colorado) and Lewis (General Electric) showed that the combination of Petersen coil and expulsion protective gap gave (in four out of five cases) fault durations of not exceeding ½ cycle. The percentage of all flashovers extinguished by Petersen coil operation in a recent four-month period averaged approximately 72 per cent.

Impulse insulation of wood

Test at Ohio Brass laboratory, reported in a paper by J. T. Lusignan (Ohio Brass) and Philip Sporn (American Gas & Electric), brought forth data which L. G. Smith (Baltimore) said should make impulse designs possible with considerable saving in construction costs. D. C. Prince (General Electric) presented a discussion by F. E. Andrews (Public Service of Northern Illinois) which said additional data on power arc follow would be a most useful supplement to the impulse flashover data in the paper.

Crossarm wood can supply appreciable impulse insulation both with pin and suspension insulators, reported Sporn and Lusignan. For minimum waves and pin insulators the wood affords an impulse insulation of some 110 to 130 kv. per foot, being lower the larger the wood sections. Fir has slightly higher flashover than pine. Pine on short time lags has a steeper volt-time characteristic than fir. Impulse flashovers of cedar or aged pine are prac-

They had just registered their attendance

Left to right—C. C. Warne, Jr. (Hubbard & Company), W. R. Van Steenburgh (Okonite), E. W. Osterreich (Duquesne Light) and Col. Azel Ames (Kerite)

tically alike and independent of treatment in lengths up to six feet with unimportant departures. New creosoted pine poles have considerably less impulse strength at minimum flashover values, but they improve with aging. This the authors attributed to retained moisture at the outset.

Removal of the down lead (of the overhead ground wire) from the pole and use of wood braces was demonstrated to be an effective way of increasing impulse insulation. On the whole the data are deemed sufficient to enable a reliable determination of the over-all insulating properties of assembled structures from the values obtained for the constituent parts.

Network analyzers in ascendency

Calculating boards ruled the sessions of the instruments and measurements committee. Not only were the technical details of the new a.c. network analyzer of the General Electric Company discussed, but there was a comprehensive substantiation of the boards in general as indispensable tools of system planning for maximum capital economy and operating reliability. Merrill DeMerit (West Penn) said also they have brought about a sympathetic understanding between operating and engineering design groups that has been particularly beneficial in handling load distribution problems. They give quick answers, where months of laborious computation had given only partially dependable solutions. On his system, in fact, they call them operating boards rather than such forbidding titles as "harmonic network analyzers," etc. H. P. St. Clair (American Gas & Electric) said his company uses all four readily available boards (East Pittsburgh, Chicago, M.I.T. and Schenectady) to make six or more studies every year.

The Westinghouse board has been used for more than 200 studies (some even for India) and W. W. Parker said about half have been on voltage control and load regulation, with the remainder devoted principally to stability and the optimum selection of system configurations. Some 5 per cent were on networks and low-tension distribution. In general, they show how to utilize existing facilities, defer expenditures for new ones and then show how new facilities should be selected and located. L. A. Nettleton (Consolidated Edison) attested to the accuracy and versatility of the new G.E. board.

It was R. N. Slinger, however, in amplifying the Kuehni-Lorraine paper on the new G.E. board, who most comprehensively enumerated the benefits derivable:

1. Effects of various amounts of synchronous condenser capacity on bus voltage at important stations under both normal and emergency operating conditions.
2. Best location for new generation.
3. Best arrangement of station or system connections for new generation to obtain maximum degree of system stability and investigation of the effect on breaker interrupting duty.
4. Actual value of a proposed addition to a transmission or distribution system in terms of improved voltage conditions, increased stability limits or reductions in the loading of existing circuits.
5. Wattless flow around a system and selection of methods for reducing it to a minimum.
6. Bank ratings in case of a new transformer bank that is to be connected in a loop circuit or network.
7. Improvement in system voltage to be expected from the addition of a voltage regulating transformer or a phase-shifting transformer to a loop circuit or network.
8. Time required for a synchronous generator to pull out of step after complete loss of excitation and the effect upon the rest of the system.
9. Starting and pull-in characteristics of large synchronous motors connected to a transmission system at some distance from nearest generation.
10. Relay currents under three-phase and unbalanced fault conditions, particularly on tie lines during transient disturbances.

Distribution arresters surveyed

Comprehensive survey of practices in lightning protection of distribution transformers was reported by L. G. Smith (Baltimore) based on the practices of some 40 utilities. Conclusion was drawn that with rate of blown primary fuses as the criterion the solid interconnection with tie to case seems to be the best. Conventional solid interconnection, common primary and secondary neutral schemes, the SP transformer, the three-point connection, the standard connection and the gapped interconnection follow in the order named. As for winding failures, the data are slightly inconsistent, but the newer methods are believed preferable to the standard connection; however, the three-point connection and gapped interconnection are practically no better. Lightning arrester failures are less with solid interconnection and it also seems not to increase meter burnouts. However, some of the improvement should probably be attributed to decrease in ground resistance attending the installation.

Grounding of tanks is a growing practice, said Smith, and there also seems to be an increased tendency toward installing secondary arresters on customers' premises.

New classification and nomenclature is desirable, in the view of J. R. North, and he suggested that the prevailing variations could be treated as modifications of three basic protective schemes: (1) Non-interconnection, (2) solid interconnection and (3) gapped interconnection.

Paucity of data in the Smith paper was given by Herman Halperin as his reason for dissenting from some of Smith's inferences. He did say, how-

ever, that the data should dispel fears for customer safety with solid interconnection and, in Chicago, it has reduced fuse blowing and transformer burnouts by fully 50 per cent. Some of the improvement in failure rate with interconnection was attributed by W. G. Roman (Westinghouse) to the fact that many of the new interconnection installations embraced the newer types of arresters.

Transformer insulation discussed

V. M. Montsinger's paper in the Thursday morning session on electrical machinery touched on the front-of-wave impulse testing of transformers and mentioned 1,000 kv. per microsecond as a possible rate of voltage rise for such tests. K. B. McEachron presented data to support the contention that due to wave shape the rate of rise to be expected for low-voltage circuits may be less than for high voltage and, therefore, because of the lower insulation level, the same rate of rise should not be applied to low-voltage transformers in front of wave testing. J. E. Clem (also General Electric) showed that measured values of rate of rise range from 40 to 2,000 kv. per microsecond in service with only a few exceeding 500.

Reference in F. J. Vogel's (Westinghouse) paper was made to the reduction in dielectric strength arising from air entrapped within the insulation structure and the use of vacuum in excluding this air. L. H. Hill (Allis-Chalmers) reported that his company had been filling high-voltage transformers with oil under vacuum for about five years. He reported that if transformer tanks were filled with oil from the bottom as long as four days were required to rid the oil of air. However, if the tanks were filled from the top, so that oil went into the transformer as foam, by the time the tank was full the oil was quiet, indicating that all the air was removed. Other discussers pointed out that short-circuit heat runs provided a practical method in the field for freeing air from the transformer where application of vacuum would be awkward and inconvenient.

Carrier and differential relaying

Experience with carrier relaying as an economical alternative to the Merz-Price pilot system was stated by Philip Sporn and C. A. Müller (American Gas & Electric) to be capable of solving the transmission problem wherever the necessity arises of counterbalancing the deleterious effects of system faults by the utmost speed in removing them or where high-speed reclosure is desired in a time so short that no ill effect of the initial fault results. Their system has 34 installations and they call it a universal form of relay protection. Especially it affords the opportunity to add sectionalizing stations without disturbing the preceding relay set-up or increasing sectionalizing time. Carrier relaying is also adjudged by the authors to be the only form of relaying practically capable of giving short enough sectionalizing time to keep surge durations short on systems sensitive to fault-initiated voltage disturbances.

Typical costs per terminal of $4,000 to $4,500 were cited by E. E. George and the carrying charges make the operating outlay some $40 per month per terminal. Conversely, communication channel rentals are typified by $100 per month per terminal. Manifestly the pilot system of relaying is indicated for shorter lines and carrier for the longer. Müller differed with George's mention of 10 miles as border-line value between the two protective schemes, believing that carrier can compete economically with pilot for shorter distances.

T. G. LeClair (Commonwealth Edison) was disturbed by the blithe assumption of the authors that carriers always get through to the other end. Paralleled circuits in Chicago involved 30 miles of overhead and 6 miles of cable. One cable had solidly bonded sheath; the other had impedance bonding. Carrier came through on the former, but not on the latter.

E. H. Bancker (General Electric) said that system stability was originally the sole reason for resort to carrier relaying, but up to nine other reasons (seven were reported by the authors of the Harden-Lenehan-Goldsborough paper) could be cited to justify its adoption.

Fertile field of application for harmonic differential relaying to protect transformers and rotating machinery was envisioned by R. L. Webb (Consolidated Edison) in commenting on the Kennedy-Hayward (General Electric) paper. G. Calabreese of the same company said the manufacturers seem ready only to offer schemes which hold systems together and separate them only after a delay. There is call, he said, for more equipment to meet the needs of those who feel they require instantaneous separation under fault conditions. In support of his assertion he cited a high impedance tie paralleling the main ties between Hell Gate and the Niagara Hudson link which calls for special consideration not met by relay facilities covered by the session papers.

H. P. Sleeper (Public Service Electric & Gas), advocate of simplicity in relaying, decried the multiplicity of relaying devices offered by the manufacturers and said he was on

Electric transportation drew energetic support

Left to right—Morris Buck (*Transit Journal*), C. W. Chase (president Indianapolis Railways) and A. H. Woolen (Aluminum Company)

the point of suggesting that about two-thirds of them be eliminated from the picture. O. C. Traver (General Electric) likewise deplored the tendency to build too much intelligence into relays.

Wide prevalence of differential relaying pointed to the call for an externally connected device to afford the harmonic current restraint of the Kennedy-Hayward paper, said T. W. Trice (Baltimore).

Utility experience with carrier telephone

A new single-channel carrier telephone system designed to meet the needs of power systems, oil companies and railroads was described in Monday morning's communication session by H. J. Fisher, M. L. Almquist and R. H. Mills. Eliminating the need for stringing additional wires, the type H single-carrier system provides additional telephone circuits one at a time on open wire lines where growth is not rapid. A unique feature of the system is the use of copper oxide modulators and demodulators in place of vacuum tubes.

In an absentee discussion of this paper, E. E. George (Tennessee Electric Power) characterized a type H carrier installation on a company telephone line between Nashville and Chattanooga installed in October, 1937, as providing "one of the finest talking channels we have ever used." Quality and volume were reported above that of the best toll circuits and noise level almost zero. This point was particularly remarkable, Mr. George stated, in view of the fact that 85 of the 165 miles of power company telephone line over which this channel operates are on the same right-of-way as a 110-kv. transmission line.

Mr. George further stated that space requirements of the type H system terminal were small and that its low cost made the system very attractive to power companies and others even on relatively short telephone lines. A type H carrier terminal has recently been installed by a neighboring company over a 20-mile telephone circuit on a power line right-of-way where rectifier noise made the voice frequency circuit unusable. The new channel, he reports, has been so satisfactory that a second is being installed.

Familiar with the usual weakness of copper oxide rectifiers in the matter of heating, aging and overloading, Mr. George found it remarkable that rectifiers had been found satisfactory as modulators and detectors in a high-grade communication circuit. He asked the authors for expansion of the paper's statement that in some respects the copper oxide modulators are superior to vacuum tubes. In reply it was pointed out that vacuum tubes do not provide as high output as the copper oxide modulators. In addition, good balance can be had with this type of modulator. They also have the advantage that the constant test and adjustment required with vacuum tube modulators to keep carrier leak down is not necessary with the copper oxide "varistors."

At the present time there are 35 type H systems in service, with the engineering completed for many more on lines varying in length from 25 to 160 miles.

Current-carrying capacity

Of major interest in the cable and wire session was an exhaustive discussion of the current-carrying capacity of rubber-insulated conductors, pointing definitely toward revision of the prevailing code requirements. Results of a six-year program of test by N.E.M.A. wire members was reported by S. J. Rosch (Anaconda Wire & Cable) for the group. They found that present code values as to current rating are essentially the rounded-out values found by Fisher in 1906; that these, in turn were evolved from those reported by Dr. A. E. Kennelly in ELECTRICAL WORLD, 1889 (Vol. 14), and that these take inadequate account of multiple conductors in conduit, the nature of the outer covering (braid or lead), the outer covering color (black or white) and the effect of concealment or exposure and vertical or horizontal mounting.

First, the investigation found new values (530 to 818 for braided cables in air and 747 to 982 for lead cables in conduit) instead of the prevailing 1,200 for thermal surface resistivity in degrees C. per watt per sq.cm. They also derived new correction factors for conduit installations and for varying ambient temperatures associated with a maximum safe operating temperature of 50 deg. C. for rubber (code) insulated conductors. Conclusions expressed the hope that the results of the investigation will not only be reflected in code revision but that designers will use the data in fixing current-carrying capacities for other types of insulated cables as well as for rubber. This is especially true of sizes larger than No. 6.

Prof. H. B. Dwight (M.I.T.) added information about single conductors in concrete-incased fiber ducts with copper at 40 deg. C. in terms of degrees C. per watt per foot of duct (thermal ohms per foot):

Size, No.	Number in Duct	Thermal Ohms
4/0	1	5.0
	2	3.8
	3	3.4
500,000 circ. mil	1	4.9
	3	2.9

Uniformity of cable fabrication

Methods of evaulating the mechanical characteristics of cable insulation were presented by Wyatt, Smart and Reynar (Detroit Edison) in a paper which emphasized the styrenated wafer technique (see also ELECTRICAL WORLD, December 4, 1937). Granted the use of low-loss paper and oil, along with thorough drying, degassing and impregnation, the authors assess cable quality upon the elimination of voids through greater uniformity in the tape wrapping. By means of the various techniques proposed they look toward improved load-cycle stability and further reduction in insulation thickness.

W. A. DelMar (Habirshaw) suggested that "inventors are congenitally optimistic" and doubted whether the styrene wafer will reveal much not now known to the manufacturers of cable and cabling machines. Nor did he agree that application of it will result in higher voltage ratings or decrease in insulation thickness. R. J. Wiseman (Okonite-Callender) cautioned that too much tension in taping means too little oil and too little tension means too ready mobility of oil, and it is not at all certain that uniform tension will give best cable performance. A utility engineer (Herman Halperin, Chicago) took the middle ground and credited manufacturers with having done much in the last decade to better their product as to tension and overlap of tapes. What really constitutes a good wafer is a question in the mind of R. W. Atkinson (General Cable) because poor-looking wafers

[*Continued on page 127*]

Saves $4,000 Each Year With Purchased Power

By LAWRENCE M. DURYEE

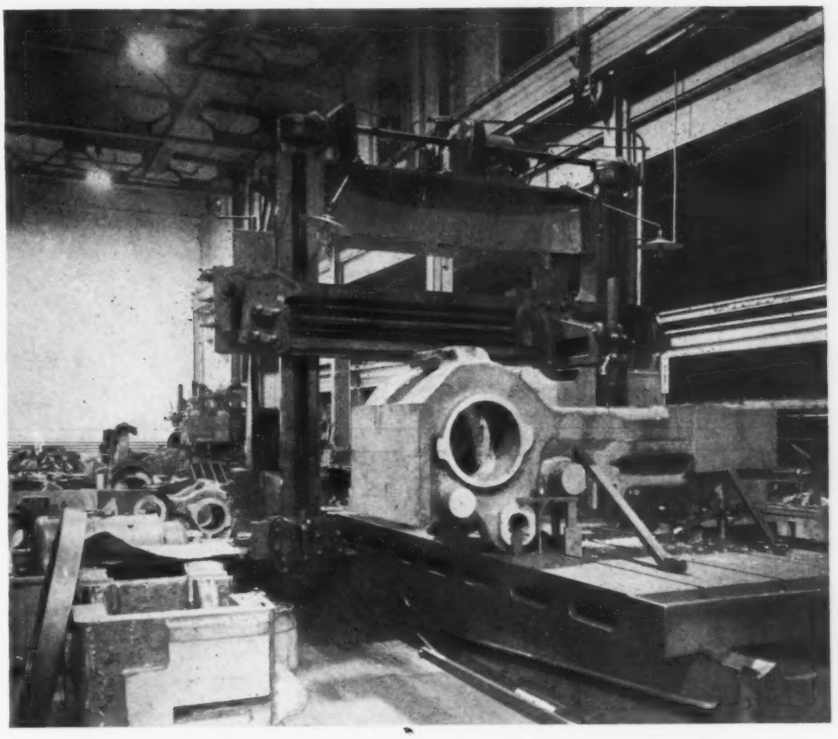
Connecticut Light & Power Company, Waterbury, Conn.

INVESTMENT in a change-over from generated to purchased power undertaken by the E. J. Manville Machine Company in May, 1935, at the suggestion of the Connecticut Light & Power Company is being returned at the conservatively estimated rate of $3,000 to $4,000 each year from power cost savings.

Prior to the change-over this company generated practically all of its power requirements, purchasing only night and week-end needs. A 150-hp. Corliss steam engine belted to a main shaft supplied mechanical power to the mill and operated a 50-hp. d.c. generator servicing crane and hoist motors. A 50-hp. motor-generator set only was supplied from the power company lines and this was used for night operation.

A report based on a survey of the plant by the local power company convinced the management of the Manville company that substantial savings could be effected by shutting down the engine entirely, dropping boiler steam pressure to 5 or 10 lb. for heating in winter, eliminating steam completely in the summer months and using purchased power the year around.

Accordingly a 75-hp. synchronous motor was installed to drive the main mill shaft. Several induction motors, totaling about 100 hp., were mounted on large individual planers and shapers so that the flexibility and economy of individual drive could be obtained on these machines. Several small motor-driven pumps were also installed replacing steam pumps, to supply the boiler with feedwater and to produce the heating system vacuum. With these changes a new underground secondary from the transformer was installed and new customer-owned lighting transformers were purchased.



Modern lighting parallels a change to purchased power in Connecticut machine company

A section of the shops of E. J. Manville Machine Company, Waterbury, showing some of the twelve high-bay 400-watt mercury units that produce an average intensity of 15 ft.-candles.

It was also pointed out to the customer that a proper lighting installation could be made at the least cost at the time when the power installation was being accomplished. Advantage was taken of this fact and a total of 30 kw. of modern lighting units were installed, resulting in a general lighting intensity of 15 foot-candles throughout the factory. Three-hundred-watt units were mounted on 10-ft. centers and were supplemented by local units at each machine. In the high bays 400-watt mercury units were installed.

The former engine room was converted into a heat-treating room. The hardening room had previously been located at a point so far distant from the main shop and the boiler plant that trouble had been experienced in heating it. In the new location conditions were improved for greater facility in moving tools to and from furnaces.

Since the change-over took place production has increased at the rate of about 100 per cent per year. The light, heat and power costs, however, have been but a fraction of the costs when steam was used. For example, in 1929, a peak production year, manufacturing at this plant was about 100 per cent above that for 1936, yet the light, heat and power costs for 1936 were $7,000 under that for 1929. Production for 1936

[*Continued on page 126*]

Upper Salmon Falls Harnessed for Power

Prefabrication of concrete forms for power house permits operation same year as initiation of construction —Outdoor equipment cuts costs

By H. L. SENGER

Chief Engineer Idaho Power Company, Boise

NOW available to the Idaho Power Co. system are 18,000 kw. of hydro generating capacity from the sixth of the company's developments on Snake River, Idaho. This is the plant at Upper Salmon Falls, foreseen 30 years ago, at which time a considerable portion of the then proposed water carrier system was actually built. But though the inception of the idea is a generation old, the plant itself is newborn, and several phases of construction constitute new practices today.

Such, for example, was the method of fabricating concrete forms (Fig. 1). Construction of these was started before the power house excavation was complete. This was made possible by building a layout platform for prefabricating the forms.

The plan of form building in advance of the progressive steps of building the power house as detailed in Fig. 1 contributed, in a large measure, to the fast schedule of construction. Forms which require weeks to build were loaded, hauled and assembled in place in but a few days. The schedule for pouring concrete was speeded up and no time was lost in cleaning up the accumulation of débris usually resulting from building forms in place.

Nine units or subdivisions comprise the entire development: Construction of the regulating dam, upper canal wall and spillway, canal, lower canal walls and spillway, power house and tailrace, substation, retaining wall and yard fill for substation, roads, and operators' village.

A large part of the construction was done by contracts, including flashboard section and three intake bays at the regulating dam, upper canal wall and spillway, canal, lower canal walls and spillway, power house and tailrace excavation, roads, and operators' village.

The first work, that of excavating for the power house and tailrace, was started the latter part of February, 1937, and the first of the two units was placed in commercial operation September 11, the same year; the second a few weeks later.

Canal

At the western end of Dolman Island (Fig. 2) the south channel swings northerly to join the north channel, the river then makes a wide sweep westward to the power house site and again swings sharply to the northward. The land on the south side of the river between the point where the south channel turns north around Dolman Island and the power house site was high, making possible a canal location entirely in earth (Fig. 4). After very extensive prospecting with test holes it was found that the elevation of the underlying sheet of lava was such that very little solid rock excavation would be necessary in the construction of the canal. The test holes also revealed the fact that the lava was overlaid with a strata of impervious clay. Thus natural conditions provided an ideal canal location.

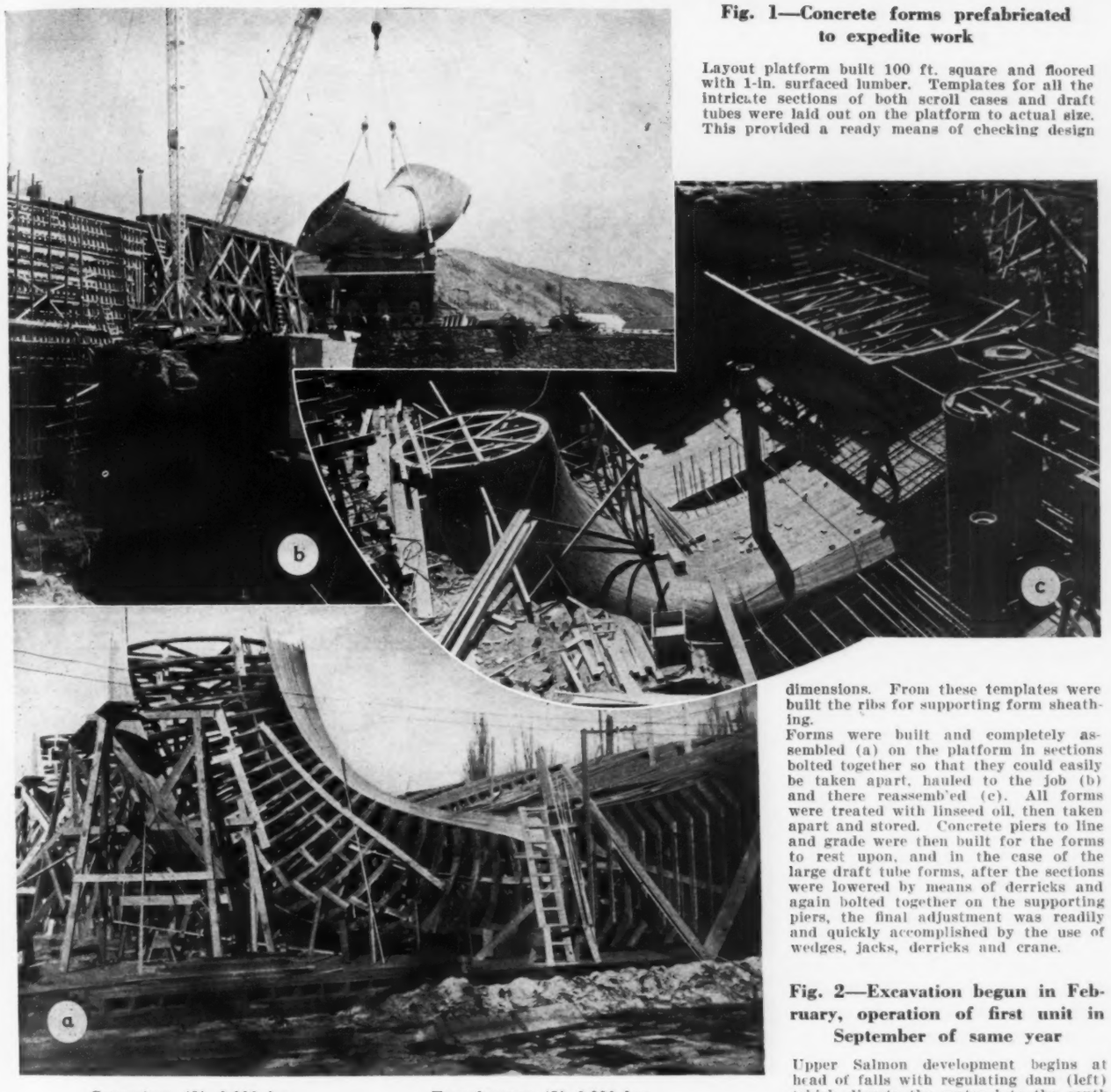


Fig. 1—Concrete forms prefabricated to expedite work

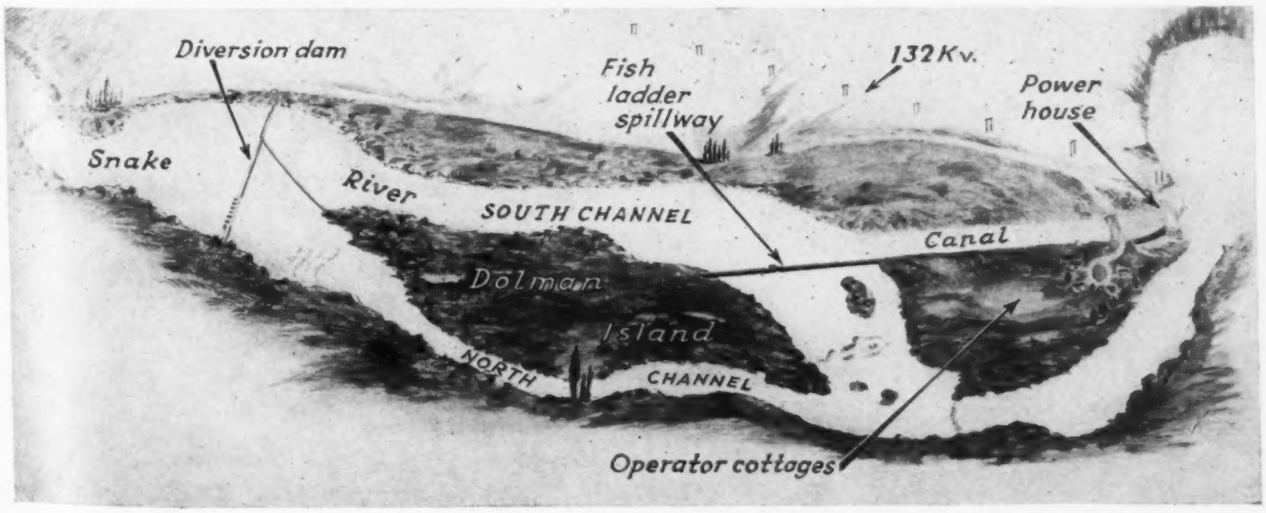
Layout platform built 100 ft. square and floored with 1-in. surfaced lumber. Templates for all the intricate sections of both scroll cases and draft tubes were laid out on the platform to actual size. This provided a ready means of checking design dimensions. From these templates were built the ribs for supporting form sheathing.

Forms were built and completely assembled (a) on the platform in sections bolted together so that they could easily be taken apart, hauled to the job (b) and there reassemb'ed (c). All forms were treated with linseed oil, then taken apart and stored. Concrete piers to line and grade were then built for the forms to rest upon, and in the case of the large draft tube forms, after the sections were lowered by means of derricks and again bolted together on the supporting piers, the final adjustment was readily and quickly accomplished by the use of wedges, jacks, derricks and crane.

Generators (2) 9,000 kw.
Turbines (2) 13,000 hp.
Effective head 44 ft.
Transformers (2) 9,000 kva.
Canal cap. 6,300 sec. ft.
Gantry crane cap. 75 tons
132-kv. Transmission line 31 miles long

Fig. 2—Excavation begun in February, operation of first unit in September of same year

Upper Salmon development begins at head of falls with regulating dam (left) which diverts the water into the south channel, where it is directed into a canal by concrete wall embracing a spillway and fishladder.



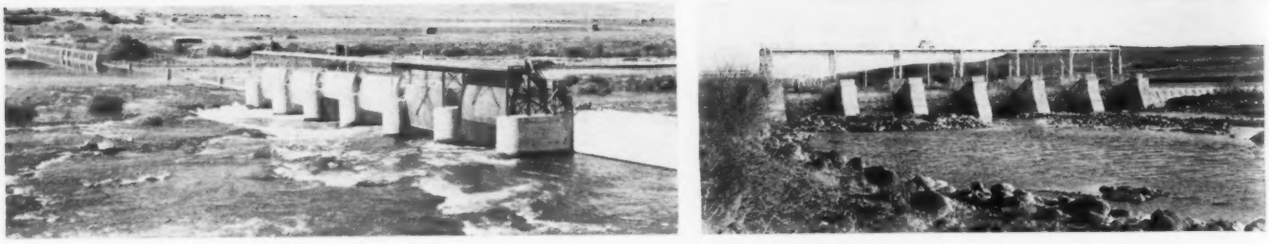


Fig. 3—Regulating dam in three sections

Left—Tainter gate section, looking downstream. Right—Same, looking upstream.

The regulating dam is a concrete structure 1,617.6 ft. long. On the north side of the river there is a gravity section 191 ft. long. Adjoining this section on the south is a 236-ft. tainter gate section composed of six 15x30-ft. tainter gates, supported by concrete piers on 38-ft. centers. The piers serve the further purpose of carrying a gate hoist bridge. In the center is a flashboard section 501 ft. long. This dam has a crest width of 2½ ft. and varies in height from 5 to 14 ft. The front face is vertical and the back has a batter of 7⅝ to 12. Two-foot flashboards are supported by 2½-in. galvanized pipes set in sockets spaced 6 ft. on centers.

On the south side of the river there is a gravity section 225.6 ft. long. Adjoining and to the north of this section is the intake, which is 464 ft. long and is composed of three sections. The south section has nine 39-ft. bays. Adjoining this on the north there are two trash gate bays of 34 ft. each. The third intake section consists of three 39-ft. bays. A low concrete dam with flashboards extending from the north end of the intake to the head of Dolman Island separates the north and south channels. The function of the dam is to confine floodwater to the north channel.

Fig. 4—Conditions ideal for canal location

The canal, including the upper canal wall and spillway, is 3,495 ft. long, the length of the earth section being 2,050 ft. and the wall section 1,445 ft. The canal is designed to carry in excess of 6,500 sec.-ft. of water. At the standard section it has a base of 200 ft. and a water depth of 10 ft. Slope of sides is 2 to 1, protected against wave action by an 18-in. layer of loose rock. There is a 10-ft. berm along each side, surfaced with gravel, 7 ft. above water level. Approximately 400,000 cu.yd. of material was moved in the excavation of the canal.

Upper canal wall and spillway connects the lower or west end of Dolman Island to the south bank of the south channel and forms the north canal wall across the south channel.

It is a concrete structure 1,495 ft. long. The east abutment is a gravity section 45 ft. long and 2½ ft. wide on top with the upstream face vertical and the downstream face built on a batter of 8¾ to 12. The spillway is a gravity section 1,400 ft. long and 2½ ft. wide on top, varying in height from 4 to 11 ft. The upstream face is vertical and the downstream face built on a batter of 8¾ to 12. The crest of the spillway, which is 2 ft. below the abutments, has 3½-in. pipe sockets spaced 6 ft. on centers for supports for 2-ft. flashboards. There are four 6-ft. stoplog openings extending down to the elevation of the river bed. A fish ladder having four bays provides a means for fish to pass up the river.

Upper canal wall connects to the earth canal bank by means of a concrete abutment 50 ft. long. A cut-off wall extends 20 ft. downstream from the junction of the spillway and west abutment. Adjoining the west concrete abutment the canal bank is protected by a facing of rubble masonry for 50 ft. and beyond the rubble masonry by heavy hand-laid rock riprap for 58 ft.

The canal connects to the east wall of the power house by means of concrete walls. The south wall is a gravity section 141.6 ft. long with an average height of 37 ft. Where this wall connects with the earth bank a cut-off wall extends into the hillside approximately 90 ft. The cut-off wall rests on solid rock and extends well into the impervious clay strata overlaying the rock. The canal bank east of the concrete wall is lined with a covering of rubble masonry 70 ft. long. Beyond the rubble masonry rock riprap extends 75 ft.

The north wall is also a gravity section 262 ft. long with an average height of 37 ft. A spillway 150 ft. long is provided in this wall. Crest of the spillway is 7.3 ft. below the top of the wall. The canal bank east of the concrete wall is lined with a covering of rubble masonry 70 ft. long. Beyond the rubble masonry rock riprap extends 75 ft.

Power house

Substructure of the power house, designed to meet the requirements of the scroll cases and draft tubes of the hydraulic units and to support the superimposed loads of generators, water wheels and water thrust, is constructed of reinforced concrete. Maximum depth of draft tubes is 32 ft. below tailwater. Draft tube is divided into two parts by a central bearing wall. Each opening into the tailrace is 14 ft. 4 in. high by 19 ft. 6 in. wide. Structural steel guides on the downstream face of the substructures are provided for draft tube gates. The low setting of the water wheels relative to the tailwater level made it necessary to provide for gates at the outlet of the draft tubes to prevent the unit from being flooded by tailwater when unwatered for inspection or repairs. The two tubes are separated by a 12-ft. bearing wall. In this is located a pump sump 7 ft. in diameter, extending 5 ft. below the draft tube. Draft tubes can be drained into the pump sump through 16-in. pipe laid under the concrete floor of the draft tubes. The pipes are closed off in the pump sump by means of 16-in. angle gate valves. Weep holes in the draft tube floors relieve excessive uplift pressures.

Generators are not housed, being outdoor type, located on a concrete deck 25 ft. above tailwater at station-yard level. A pit 17 ft. in diameter extends from under the generators to the turbine tap-plate.

The east wall of the power house is of reinforced concrete, rising 30 ft. above the generator deck. The lower canal walls connect to either end of this wall to form the canal forebay at the power house. Intake openings to the scroll cases through the east wall are 18 ft. high by 19¼ ft. wide. The single structural-steel intake gate weighs 25 tons. When not in use it is stored in a pit in the top of the east wall.

The operating room, measuring 12½x60 ft., is on the downstream side and below the generator deck. Here are located the switchboard, low-tension oil switch cubicles, governors and oil pressure receivers, control battery and local service switchboard. At either end of the operating room a tunnel connects with the generator pits, with access

[*Continued on page 118*]

Water Heater and Range Produce Satisfactory Load

Average usage doubled and load factor increased to 40 per cent by combination load

By R. R. HERRMANN

Manager Rate Department, Northern States Power Company, Minneapolis, Minn.

ABOUT ten years ago an investigation of the electric load characteristics of a then new residential district located just outside the city limits of Minneapolis, and known as the Country Club district, was undertaken. This district had at that time a high saturation of electric ranges, as well as of other electric appliances, and was selected for study with a view toward determining load and diversity factors and other pertinent data. The results of this study were summarized in the ELECTRICAL WORLD (Vol. 88, page 1259).

During the succeeding ten-year period the district experienced considerable growth. Furthermore, an entirely new factor entered the situation with the development and sale of the "Off-Peak" controlled electric water heater; hence it was felt desirable to conduct another survey of the same district to determine what changes in load characteristics, if any, had occurred.

A recording demand meter (fifteen-minute interval) was placed in the 2,300-volt feeder supplying this district and a field check made of secondary lines to determine which homes were being served from the metered feeder. Weekly readings of feeder demands and kilowatt-hours, together with strip charts, gave sufficient information to determine load curves and monthly consumption. Monthly kilowatt-hour sales to customers were obtained from the meter books. The first survey covered only four months in the spring, whereas the recent one covered an entire year. The effect of the Country Club present feeder load on the total system load is shown by the charts.

R. R. Herrmann

From the data of the 1936 investigation, from the ten years feeder load comparison and from the parallel graphs of feeder and total system loads as of today certain conclusions applicable to our system may be drawn. They are:

1. The addition of electric ranges and water heaters has nearly doubled the average use and has increased the feeder annual load factor from about 28 per cent to 40 per cent.

2. The company's present selection of hours during which electric water heaters are shut off appears to be correct, the 4 p.m. to 7 p.m. period being necessary in winter and the 10 a.m. to noon period being necessary in summer, in order that the water heaters contribute little if anything to the system or substation peak loads.

3. The average demand of a group of residential customers liberally equipped with appliances is about 1.3 kw.

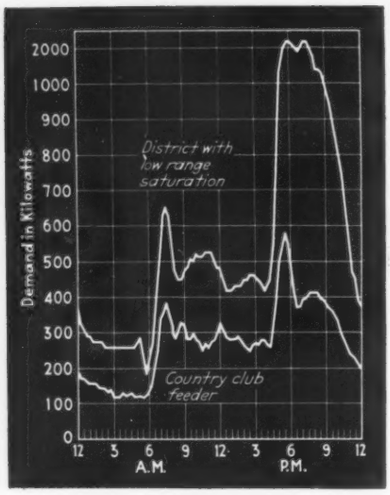
4. The range load is contributory to feeder peaks and in the winter is contributory to station peaks also.

5. The range load of itself does not have a good load factor, but when water heaters and ranges are added together the net result is an improved feeder load factor.

Average number of residential customers increased from 76 in 1926 to 405 in 1936, of which 168 had electric ranges and 130 had electric water heaters, giving a range saturation of 41 per cent and a water heater saturation of 32 per cent.

Average use increased from 176 to 342 kw.-hr. per month. This increase is caused primarily by the water heaters, as the present average use, excluding the water heating consumption, is 219 kw.-hr. per month.

Maximum demand increased from 1.09 kw. to 1.32 kw. per residential customer. This demand per residence of 1.32 kw. was obtained by deducting from the demand of the entire load of the district the estimated demand of street lighting, commercial lighting and power loads. These latter account for only a very small percentage of the



Effects of combination range and water heater load

Comparison for Tuesday, December 17, 1935, of the daily load characteristics of the Country Club feeder and of a similar district which has only a few electric ranges. This chart indicates that the high peak of the Country Club feeder at 5:30 p.m. is caused by the ranges, and that without them the peak at 6 p.m. would have been no greater than at 8 p.m. The difference between the demands at 5:30 p.m. and 8 p.m., or 160 kw. (see chart), of a peak winter day may then be taken as the demand for which the ranges are responsible. Since there were 170 ranges connected in December, the average additional peak was only 0.94 kw. The kilowatt-hours used by ranges is not known, but if we assume 1,500 kw.-hr. per range per year and an average increase in demand of 0.94 kw., the annual load factor so obtained is 18 per cent. By adding to the 1,500 kw.-hr. the average consumption by water heaters, namely, 4,583, the load factor of the range-water heater combination becomes nearly 74 per cent.

Comparison of 1926 and 1936 Surveys

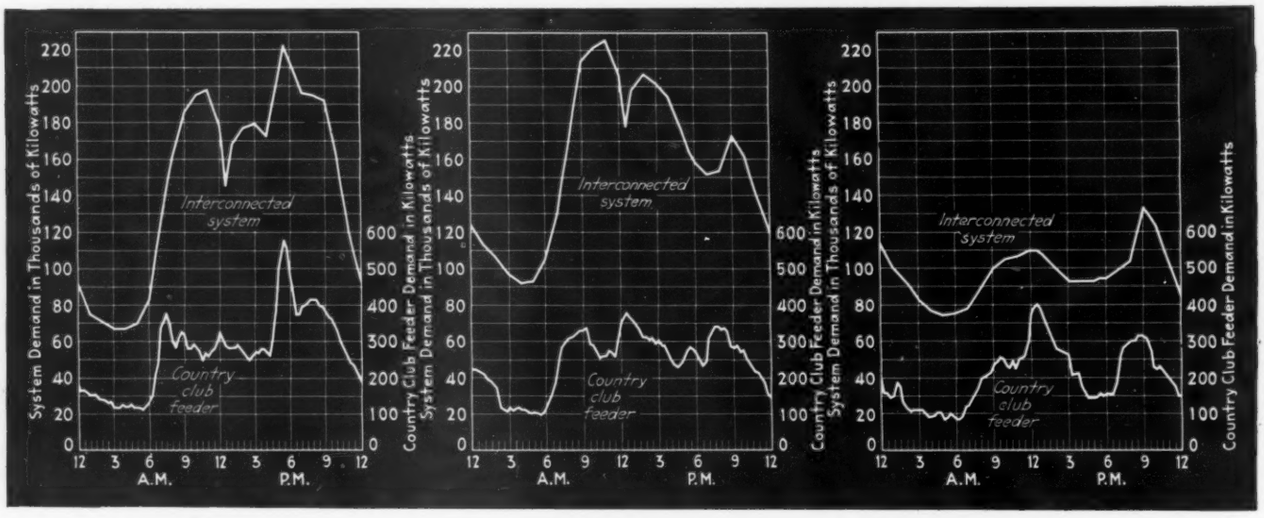
	1926 Survey 4 Months (Feb., 1926, to May, 1926, Inc.)	1936 Survey 12 Months (July, 1935, to June, 1936, Inc.)
Average residential customers	76	405
Number of ranges	64 (84%)	168 (41%)
Number of water heaters	0	130 (32%)
Average monthly use — Residential	176 kw.-hr.	342 kw.-hr.
Excluding water heating	176 kw.-hr.	219 kw.-hr.
Maximum feeder demand	93.6 kw.	379 kw.
Estimated residential only	82.6 kw.	537 kw.
Average residential demand	1.09 kw.	1.32 kw.
Annual load factor	28%	40%
Distribution loss	14.3%	6.8%
Transformer capacity installed		
Maximum loading (90% p.f.)	43.3%	114.5%

total, so that a considerable error in such estimate would change the results very little. Since the maximum demand registered during the 1926 survey was in February of that year and the last one in December, 1936, a speculation as to the reason for the increase must be made with some caution.

The annual load factor of the feeder increased from 28 per cent in 1926 to nearly 40 per cent in 1936, an increase that is largely caused by the addition of electric water heaters. The maximum demand of the feeder occurred at 5:30 p.m. in December. Since the water heaters are controlled by clock switches which present the supply of energy from 10 a.m. to noon and from 4 p.m. to 7 p.m. daily, the water heaters did not contribute to the feeder peak demand. If no water heaters had been served from the feeder, the annual load factor would have been slightly less than 25 per cent.

It will be noted that this figure agrees favorably with the four-month load factor of 28 per cent which occurred in 1936.

Distribution losses decreased from 14.3 per cent in 1926 to only 6.8 per cent in 1936. This decrease is primarily caused by a rearrangement of transformers to reduce the length of secondary lines and the laying of additional underground primary voltage cables. The use of larger sized transformers which are more heavily loaded also reduced the percentage loss.


System Demand in Thousands of Kilowatts
Country Club Feeder Demand in Kilowatts
Interconnected system
Country club feeder
12 3 6 9 12 3 6 9 12
A.M.
P.M.

Feeder and system on a peak winter day

Daily load curves of the Country Club feeder and the company's interconnected system for Tuesday, December 17, 1935, a peak winter day for the system load. It is interesting to note the drop in feeder demand immediately after 10 a.m., the time the water heaters are shut off, and the necessity of another cut-off period from 4 p.m. to 7 p.m. The daily load factor (average demand) of the system load is 64.8 per cent and of feeder 47.4 per cent.

Feeder and system on a peak summer day

Here are the load curves for Tuesday, July 14, 1936, a peak summer day for the system load. The system peak then occurred at 11 a.m. and the feeder peak at 12:30 p.m. The necessity for the 10 a.m. to noon water heater cut-off period is obvious here. The daily load factor of the system was 69.7 per cent and of the feeder 65.0 per cent, the feeder load factor being a maximum on Tuesday during the summer season mainly because of the ironing load.

Summer peaks of feeder and system occur on different days

The maximum feeder demand during the summer occurred at 12:30 p.m. on a Sunday.

This chart shows the comparative daily load curves for Sunday, July 19, 1936, a peak day for the feeder. The summer peak load of this district did not occur at the time of the summer system peak. The daily load factor of the system for this day was 69.9 per cent and of the feeder 50.3 per cent.

Electrical Equipment for Battery Trucks—I

By GEORGE H. HALL
Douglaston, N. Y.

ELECTRIC conveyors, hoists and cranes, which constitute so important a feature of the material-handling equipment of industrial plants, are limited to operation in one particular place—the place in which they have been permanently installed.

Demands of modern manufacturing, however, dictate that such equipment shall be supplemented by material-handling apparatus possessing mobility, permitting operation without the restriction of a permanent location. Such supplementary apparatus includes electric trucks and tractors which, because of their automotive nature, may be used in all parts of a plant. They can cover the entire floor area of any individual building or be employed for interdepartmental transportation between different buildings or for yard service.

Automotive material-handling apparatus of this nature is unique in that, being operated by storage batteries, its electrical equipment must be designed for operation on direct current which is supplied at comparatively low voltages. Although differing somewhat in details, the electrical equipment of the various types of trucks and tractors is virtually similar, comprising the basic elements of motor, control and storage battery.

Atlas Car & Mfg. Co.

Truck motors

Ordinary conveying trucks, which do not have auxiliary functions such as load raising, are provided with a single motor which operates the driving wheels of the truck through a differential and either worm or spur gearing. These motors are of the fully inclosed type. Generally, they are series-wound, although in a few cases compound-wound motors are used, which tend to give a slightly closer regulation of speed between that attained when the truck is fully loaded and when it is running empty. The operating voltage varies with different makes and designs from 30 to 48, but is seldom higher than the latter figure. Such motors must be designed for reversing service, but their work is naturally of an intermittent nature. They are therefore built to withstand heavy, short-period overloads, anywhere from 100 to 300 per cent being claimed by the different manufacturers.

A spring-set brake is an essential adjunct of the driving motor, since its rotation must be restrained whenever the truck is not in actual operation and no movement takes place during loading and unloading. This brake is released by the movement of a foot pedal which is controlled from the operator's platform; the motor is therefore locked at all times when the grip of the brake is not intentionally released for motor operation. Accidental removal of the foot from the pedal while the truck is in motion at once causes the brake to set and the truck to come to an immediate stop.

Yale & Towne Mfg. Co.

Brake and motor assembly

A spring set, lever-operated foot brake is set at all times to prevent movement when not intentionally released. Motors are fully inclosed and are generally series wound and designed for operation on low voltage d.c.

Trucks are rated on the basis of the maximum loads which they are designed to carry and the power rating of the particular equipment is selected by the truck builder to handle the rated load at the speed at which the truck is intended to operate, usually from 5 to 7 miles per hour, and to provide sufficient excess capacity for negotiating moderate gradients at a reduced speed.

Manually operated, drum-type controllers, which are universally

Yale & Towne Mfg. Co.

Safety interlocking controller for industrial trucks provides four forward and four reverse speeds

employed on industrial trucks, are of the reversing type for forward and reverse movement of the truck. The number of speeds provided varies with the make and the capacity of the truck. Some of the lighter trucks have but two forward and two reverse speeds, but most of those of any considerable capacity are furnished with controllers which permit three speeds in either direction, while in many of the latest designs four forward and reverse speeds are available. The speed points are used for gradual starting and for accomplishing short movements in loading, as the full motor speed is usually employed for movements of any appreciable distance. Traveling controllers are generally provided with some mechanical catch which necessitates a momentary stop at the off position before movement of the handle into the reverse position can be made. This permits the motor to come to nearly a full stop before power is again applied and undue strain upon the windings is thus avoided.

A main switch, or contactor, is also used to control the application of current to the motor. This contactor is interlocked with the controller in such a manner that, if the controller handle be left in any but the starting position when the truck is stopped, it will be impossible to reclose the contactor without first bringing the controller handle to the starting position. The contactor is further interlocked with the brake-pedal and constitutes an essential safety feature of practically all industrial trucks, since the contactor can be closed only when the foot brake is depressed and the brake released. If, therefore, the operator leaves the platform, either intentionally or accidentally, not only is the motor mechanically locked but all current is entirely cut off, so that no movement of the truck can take place until the operator has returned to his position.

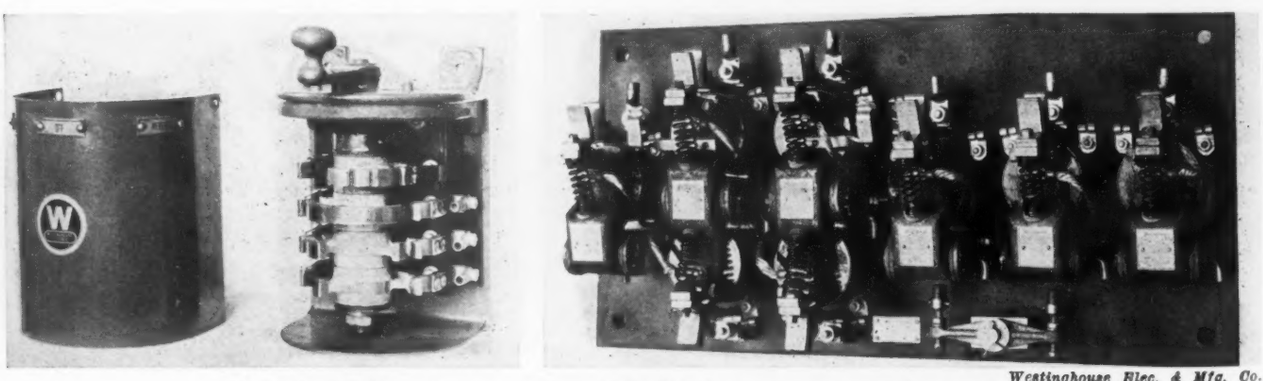
In addition to the traveling motor used on all types of electric trucks a second motor and control is required for such trucks as are provided with elevating platforms, forks, rams or cranes for the operation of this auxiliary feature. The motor for this purpose is similar to the traveling motor, but is usually of smaller capacity. Either series or compound windings may be used, as is best suited to the particular service for which it is to be used. The auxiliary controller is also of the drum type, manually operated, and provided with two or three elevating and lowering points. Upper and lower limit switches are also introduced into the elevating-motor circuit automatically to cut off the current when the extreme high or lower elevating point is reached and so prevent overtravel of the motor. Some of the larger crane trucks are furnished with a third motor and control for swinging the crane boom.

Batteries

Power for operating the motors on trucks and tractors is most generally supplied by storage batteries, although on some recently developed types a gas-driven generator set is used in place of the battery. In the present treatment of the general subject of industrial trucks the battery type only will be considered.

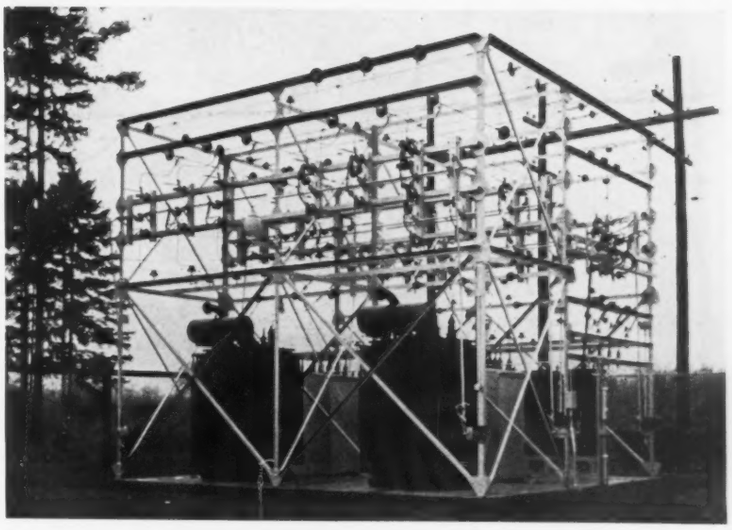
The batteries employed are of two basic types, the lead-acid and the nickel-iron-alkaline respectively. Of the former there are a number of manufacturers, so that different lead-acid batteries may be found to differ somewhat in the details of construction, but all operate on the same general principle.

[*Continued on page 132*]



Westinghouse Elec. & Mfg. Co.

Controller (left) and contactor panel (right) for use on storage battery trucks



Northern substation of the Portland General Electric Company, Portland, Ore., where two of the switch-houses were installed, controlling two 4,150-volt primary feeders. Equipment at the substation includes two 1,500-kva., 11,000/4,150-volts-Y transformers and feeder voltage regulators

Small Steel Switch-house Effects Saving

INSTALLED by Portland General Electric Company when its Northern substation was cut over recently from 2,400 to 4,150-volt operation were two weatherproof steel switch-houses. Developed from experimental units elsewhere on the system, the switch-houses are portable, easy to install and eliminate the expense of erecting a building for the switches or preparing one already built.

Utilization of company shops for construction of the units, a reversal of the earlier procedure of ordering them elsewhere, offered several advantages. It permitted alterations necessary to accommodate last-minute changes in design and saved in first costs. Materials, equipment and workmen, already a part of the shop, were utilized.

A crew of three men—two mechanics and one welder—can make a switch-house in about ten days. Cost of a house alone is about $260, and average cost fully equipped is about $1,800.

Houses are 42 in. wide, 54 in. deep, about 7 ft. 6 in. high. Framework is $2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{1}{4}$-in. angle iron, welded and amply supported by gusset plates. Outside cover is No. 10, blue annealed sheet steel.

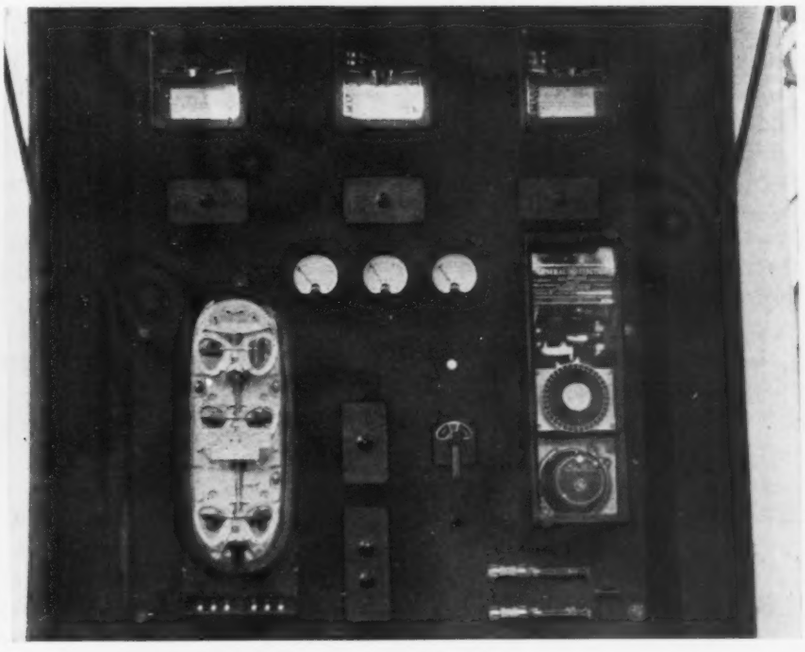
Steel doors on two opposite sides are hinged from the top. This allows them to be raised and supported, providing shelter for workmen and protection of equipment during periods of repair or adjustment.

Three 4,150-volt service wires enter

[*Continued on page 120*]

Upper front door, when open, provides a shelter

Doors on the rear, like those at front, give access to breaker and current and potential transformers. The lower door is removed by raising. The glass window permits reading the watt-hour-meter and ammeters without opening the door.



Control panel hinged to swing out and give access to back side

Editorials

S. B. WILLIAMS, Editor

Utility Buying Wave Due Soon

A MONTH ago in our annual statistical number we gave an estimate of the 1938 capital expenditures of the private utility industry as $472,000,000. Since this is more than the industry has spent for new construction in any year since 1931, the question naturally arises, when is the 1938 spending going to start?

Some of it will get under way very soon because there are managements that believe this present recession in business at the worst is but temporary, after which the power companies will need all the capacity they can lay their hands on. Others, however, are much more mindful of the trend of the output curve. Right now nationally the output is running approximately 5 per cent behind last year. The situation, however, is spotty. In several sections, including the Middle Atlantic, the 1938 output is less than 1 per cent behind 1937.

Nevertheless, it must be remembered that in 1930 the utilities, heeding the suggestion of President Hoover, did spend, only to carry much of the plant unloaded during the depression. Recollection of that situation, coupled with the knowledge that the margin between gross and net is getting smaller, makes management timid about adding further burdens to the fixed charges account while load is falling off. Any changes for the better in the trend of the output curve would undoubtedly be reflected in greatly increased utility buying. The weekly difference in output between this year and last appears to be getting smaller, and that alone would lead one to believe that utility purchasing is due for a definite upturn in the very near future.

The immediate problem is not one of money, because the industry has funds to draw on from retirement and amortization reserves to the extent of two-thirds of the year's construction budget. The larger billion-dollar program, about which so much has been written, is, of course, predicated upon the ability to finance such expenditures, and that, in turn, is made difficult at the moment by the uncertainty of the policy of the Administration with respect to the power industry.

One certain thing is that the utilities are not going to defer for long any construction that is essential to provide service. Come what may, the utilities will make every effort to maintain whatever service is demanded of them by customers.

There is the possibility, however, that management may err on the side of caution and wait longer than is wise before placing orders. If there is much of such procrastination the effect is going to be a repetition of late 1936 and 1937. Shipments will be delayed, orders will pyramid, prices rise and inventories again increase out of proportion to consumption.

Orders placed today will enjoy as low prices as the market is likely to see for some time. That in itself, in terms of the long-range picture, might involve sufficient savings to warrant purchases even if load is off, particularly if the margin between this year and last is getting smaller.

•

Plagues of Men and Plagues of Business

NO PLAGUE was ever stopped merely by curing or trying to cure the people who caught it. Plagues are eradicated and prevented from recurring by cleaning up the conditions that cause them and favor their spread. This philosophy of prevention is set forth and abundantly documented with proof in the currently popular "Odyssey of an American Doctor," by Victor Heiser. In this book Dr. Heiser tells how he and other scientists of the Rockefeller Foundation traveled up and down the world tracking down the causes and the favoring circumstances of hookworm, cholera, bubo, haws, yellow fever and other scourges of humanity.

We commend this book to the thoughtful study of business men because the parallel to stopping the economic and political plagues that beset them is exact. Let us look at it in particular reference to the electric utilities.

At various places in this country power companies are the victims of a plague the manifestations of which are rate cut orders, onerous taxation and subsidized competition by local, state and national government agencies. Like the victims of bodily plagues, they cry aloud for a remedy and they try to cure themselves, bending all thought and energy to be free of the infection that has assailed them. And, still like the sufferers from bubo or cholera, they fail to see that the plague can be stopped only by eradicating the conditions that cause the disease.

Local agitations for municipal ownership, for federal development of water power have been successful only in those places where conditions were favorable to their development. And conditions became favorable only because no effective and concerted action was taken to prevent such development. For exactly the same reason did hookworm spread throughout areas of the South, because the ground was favorable

to its propagation, because the habits of the people fostered its growth.

The drive against the electric utilities, the plague that attacks them, is the direct result of obvious causes and conditions of public misinformation, lack of information and politically or commercially inspired prejudice. The plague can break out anywhere, even in those places where utility managements are most certain of the affection and regard of the public. It is only a question of time before any given place will be affected unless adequate measures are taken against it. These measures are as obvious as the conditions they should be directed against. Public misinformation can be neutralized only by public information. Prejudice can be removed only by knowledge.

The Heisers and Noguchis of the Rockefeller Foundation stopped plagues by clearing up the conditions that caused and favored them; they dealt with countries, not with localities and persons. So, indeed, must the electric utilities proceed. They must realize that the plague attacking them is national and can be dealt with adequately only in national terms. It is true that electric utilities are local institutions. So are people. And as people must be awakened to group consciousness in order to combat a general enemy, so also must the utilities join forces to handle their common problem.

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Not 15 but 31 per Cent Affected by Subsidies

IN A press conference on January 15 the President is reported to have said that government competition with privately owned companies comprises only about 15 per cent of the area, population and power production of the country. The seriousness of such competition, however, is not its effect upon power production, but rather upon the flow of capital from investors. To what extent, therefore, is the investment in private utilities of the country directly affected?

That the PWA subsidies in the form of loans and grants to municipalities and to power districts are a form of government competition cannot be denied, especially after the announced policy of substituting competition for state regulation. Federal or federally aided power projects are located in thirty-eight of the forty-eight states and affect to a greater or lesser degree the business of companies with total fixed capital of four and a quarter billion dollars and serving 5,933,684 customers. This is approximately 31 per cent of the fixed capital (includes gas and street railways) of the privately owned electric public utilities in the United States and is 24 per cent of their total customers.

Some of the federal competition strikes at the heart of a company's system, while other projects at present affect a company to only a minor degree. Nevertheless, the mere presence of a federally subsidized project within a company's territory has the effect of raising in the investor's mind the question of freedom from further similar invasion of the company's market.

Viewed from this angle, the scope of the federal competition may fairly be said to be twice as great as the President has indicated.

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Petersen Coil Wins More Advocates

THE rest of the world is using Petersen coils—neutral earthing reactors—to an extent one hundred times as great as we have done in this country. With that disparity accumulating it was fairly timely and quite natural that a more favorable attitude toward them should have been manifested at the recent A.I.E.E. technical sessions. The promise that they can probably be effective in clearing three-quarters of present faults without necessitating a breaker opening and without, therefore, hazarding even a temporary interruption should be attractive to those who are striving to synchronize minimum capital outlay with minimum maintenance and maximum continuity of service.

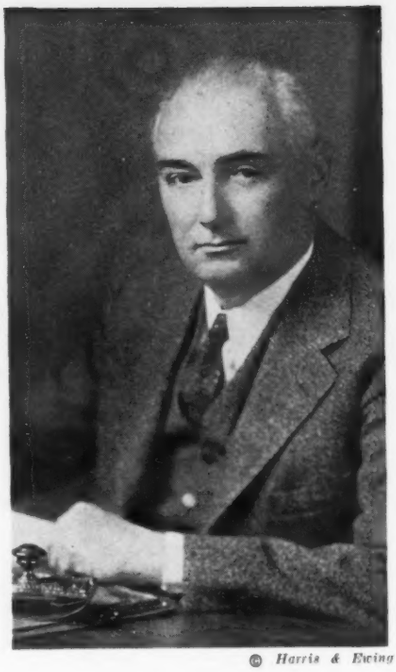
Not so far back we were using brutish methods to interrupt arcs. More recently we have resorted to deionization of paths to persuade arcs to subside quickly. This has had the effect of promoting the desire to open circuits promptly and clear the faults; reclosure has been the means of recovering the service. Now the disposition seems suddenly to be to ease off the system the consequences of overvoltages and thus relieve the breakers of functioning to clear the faults after they have established themselves. Neutralizing the condenser effects of the system by an appropriately tuned reactor—a Petersen coil—thus affords an opportunity to dispose of the consequences of overvoltages *before* they can lead to spillover that may go into a power fault.

Thus the new trend is, as H. P. Sleeper put it, to substitute a mild dosage for a major operation in cases of voltage indigestion. But with all the benefits obtainable, it should not be overlooked that the coils do not remove the transient overvoltages; they merely reduce their effects to values that can be digested without interruption. Nor are they a panacea, because, as J. R. North well emphasized, they mitigate only the effects of transitory single line-to-ground faults and have no effect on two-line-to-ground or line-to-line faults.

Despite these limitations, the seventeen present American installations promise to be enlarged materially in the near future as a result of the new wave of interest in what they can do to dispose of overvoltages without isolating a faulty section while the surge dissipates itself.

What About the Holding Company?

By CARTER FIELD



© Harris & Ewing

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

"SUPPOSE all utility holding companies should be abolished by law," senator after senator and New Dealer after New Dealer has asked me, "why would that hurt the investor in operating companies? As a matter of fact, wouldn't it be a good thing for them? Wouldn't it prevent a small group of capitalists from exploiting the small investors, by the simple expedient of having the holding company charge the operating company extortionate fees for management, engineering and other services, and taking a toll on purchases?"

These questions are honestly asked by a great many persons not connected with the electric industry. They have heard details of this or that case where the operating company *was* exploited by the holding company. They do not see why operating companies, once freed from this holding company "incubus," would not be more profitable.

President Roosevelt himself takes the same position voiced in these questions. He believes the implications in them, and this conviction is added to the prejudice which he has felt against a good many of the men at the top in the electric industry—and especially in the holding companies—dating back to about 1929. Not because of the stock market crash and the beginning of the depression, but because, as the then recently elected governor of New York, he began to run afoul of them, and later discovered that they were almost a unit in opposing his nomination for President in 1932.

In a recent press conference, to get back to the questions, the President told reporters he had talked to utility executives from Philadelphia and Pittsburgh. He asked them if the government was threatening competition with their companies. Of course the answer was "No." Mr. Roosevelt was rather amused at the absurdity of the fear, the groundlessness of which he regarded himself as thereby exploding.

There is something about Mr. Roosevelt, when he is going good, which is marvelously restraining on his visitors so far as bringing up any point he does not want discussed, or which he thinks unimportant.

But it is clear, in the present "capital strike" against Roosevelt's policy toward the electric industry, that the threat against holding companies is only *part* of the cause. It is not even a major part. But there is an answer to the questions even about the holding companies. Several answers, to which the most important are negative.

First, all dogs are not shot in August because a few develop rabies during the dog days. So a "death sentence" for all utility holding companies because of an occasional spectacular case of exploitation is hardly justified. To divert a moment, for most congressmen and New Dealers *do* divert at this point, there is a tremendous prejudice against holding companies because investors have lost a lot of money in some of the big ones. The mere fact that investors have lost money in these superstructures is at least partial proof that the capital structures of the holding companies have nothing to do with rates.

When Public Service Commission X examines operating company A with a view to revising its rates, it is not, or should not be, interested in the capital structure of holding company B, which happens to own a majority of the common stock, and thereby control, of A. It should only be interested in whether payments made by A to B are fair, whether the charges for management, engineering, etc., are equitable, and whether the purchases made by A of materials, etc., either at the direction of A or through its own purchasing agents, are at proper prices.

If A pays B too much for management fees, K not only can, but does in some instances, refuse to allow what it regards as the excessive part of the fee in calculating what it thinks the rates should be. There may be some satisfactory rebuttal to this, but no one has made it to me!

It is very hard to convince any New Dealer that just possibly a holding company might be able to provide a score of operating companies with management and engineering service at a lower charge than the operating companies could obtain them independently. Though of course every one in the industry knows that this does happen.

But there one runs into a curious phase of politics. Not even the most violent political critic of chain stores, for example, attempts to deny that chains are able to operate more economically, and thereby undersell, the individually owned stores. In fact, they are criticised for this very fact.

So maybe the argument that management and engineering services just might save the consumer money would not be very potent!

News OF THE WEEK

Electrical Manufacturers Study Pending Reciprocal Trade Pacts

N.E.M.A. to submit recommendations to Washington authorities — Merritt outlines conditions in anti-boycott injunction suit against union — Six manufacturers honored for 50 years of service

A broad study of the provisions of the pending reciprocal trade agreement with the United Kingdom, Newfoundland and the British Colonial Empire has been undertaken by the National Electrical Manufacturers Association, in convention this week at the Waldorf-Astoria in New York.

As yet the association has reached no decision as to what action will be taken. However, a definite move is expected to be made some time during the next week. Many electrical manufacturers are opposed to the lowering of the tariff on foreign-made electrical apparatus and machinery.

Will present recommendations

The results of the study now being made by N.E.M.A. and its recommendations are certain to be submitted to the authorities in Washington. These recommendations will cover matters in the agreement that concern the electrical industry in the United States.

At the Wednesday afternoon session Walter Gordon Merritt, special counsel to the fourteen electrical manufacturers and the N.E.M.A. in the anti-boycott injunction suit against Local 3 of the International Brotherhood of Electrical Workers, declared that the local union "has erected a Chinese Wall around the metropolitan area and products in intrastate as well as in interstate trade are barred from New York City unless brought under rules laid down by the union." He said that "these rules require that equipment must be unwired and disassembled so that it may be assembled and rewired by the Local 3 members. This so adds to the cost that these products are barred effectively."

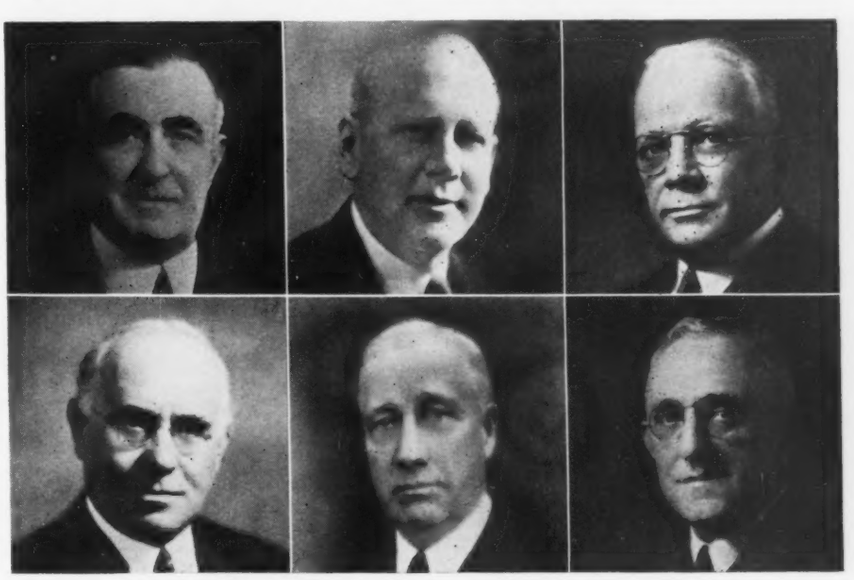
Mr. Merritt told members of N.E.M.A. how New York pays a premium on every electrical maintenance job. He said that Local 3 forced city departments to adopt the "men and means" clause in all contracts and cited testimony to show the steps that brought about the adoption of this clause and balked awards to low bidders when that bidder was non-union.

T. Y. Williams detailed the present monopolistic tendencies of labor to interfere with the free flow of trade. He discussed the present abuses regarding the prevailing wage as written into municipal and other governmental contracts. "There is a growing consciousness by the average citizen," Mr. Williams said, "to understand and protest these added costs."

The association increased the board of governors to 36 by electing H. E. Blood, president and general manager, North division, Borg-Warner, and W. F. Parker, president of Standard Transformer Company, to terms through October, 1938; Leo B. Harvey, president Porcelain Insulator Corporation, and Wylie Brown, president of Phelps-Dodge Copper Products Corporation, to terms through October, 1939, and A. I. Appleton, president and treasurer Appleton Electric Company, Chicago, and Thomas Evans, president Merchant & Evans Company, Philadelphia, to terms through October, 1940.

Presented certificates

At the annual dinner six members of N.E.M.A. who have seen fifty years of continuous service in the electrical industry were presented with an engrossed certificate by D. Hayes Murphy, president of N.E.M.A.



PRESENTED CERTIFICATES—Six members of N.E.M.A. were presented with certificates in recognition of 50 years continuous service in the electrical industry. Top, l. to r.: Edward R. Grier, Sears B. Condit, Samuel L. Nicholson, Joseph Sachs, John H. Parker, Edward H. Sniffin

Those receiving the certificates included Sears B. Condit, president and treasurer, Chase-Shawmut Company, Newburyport, Mass.; Edward R. Grier, chairman of the board of the Arrow-Hart & Hegeman Company, Hartford, Conn.; Samuel L. Nicholson, assistant to vice-president, Westinghouse Electric & Manufacturing Company, East Pittsburgh; John H. Parker, president of the Union Insulating Company, New York; Joseph Sachs, consulting engineer of the electrical division, Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., and Edward H. Sniffin, assistant to vice-president, Westinghouse Electric & Manufacturing Company.

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Canadian Taxes Seen Retarding Rate Cuts

Increased taxation in Canada was seen as retarding further rate reductions by John S. Norris, president Montreal Light, Heat & Power, Consolidated, who stated in the company's annual report to stockholders that, during 1937, 13 cents out of each dollar of operating revenue went for taxes, as against 6 cents in 1927.

Commenting on the federal income tax levied on private companies, the directors proposed that the tax, in so far as it applied to electricity, should be the subject of provincial rather than federal revenue and should become the property of the province in which it is collected.

Net income of the company for the year ended December 31, 1937, was $8,575,717, against $7,869,501 for the corresponding period of 1936. Capital expenditures during the year totaled $883,408, chiefly for new substation facilities, overhead and underground distribution lines and gas mains.

Douglas Says Utilities Have Lost Opportunities By Fighting Act

SEC Chairman pictures small group within the industry as holding back expansion plans — Declares he dislikes litigation as technique in testing regulatory measure — Sees no threat in "death sentence"

Much time and many opportunities for constructive work have been missed by the public utilities because of pending litigation to test the constitutionality of the utility act, William O. Douglas, chairman of SEC, said last week at a luncheon of the Commonwealth Club in Chicago.

Mr. Douglas pictured the utility industry as a potential major force working for the recovery of the nation, but he said that the industry was stymied by a small group within the industry intent on preserving intangible interests regardless of the cost. The heads of utilities, he said, have declared that they should spend millions of dollars on improvement, but are holding back for a variety of reasons, including a fear of what the government might do to them.

Dislikes litigation

Although explaining that the SEC has kept to its promise of not forcing provisions of the utility act until final judication, Mr. Douglas failed to explain what the SEC might do once litigation is over.

"In fairness to the industry and to our national economy, I dislike the choice of litigation as the technique for handling the problems of the act, since it is one of the most expensive form of warfare I know. Yet I can understand the motive for it. But I am shocked at the far-flung cry of 'wolf, wolf' from the mouths of management over the grave dangers of the misnamed 'death sentence,' for I know the fears which that specter generates in investors. And I know how unfounded that fear is, because I know that its basic threat is not to investors but to certain types of management essentially concerned with retaining economic power."

Mr. Douglas said that the once united front against the act no longer exists. "Many realists in the field have taken a full measure of the act and have concluded that they can and will live and prosper under it," he said.

The whiphand of New York finance was seen by Mr. Douglas as the force which is preventing operating utilities from putting into effect large scale construction improvements.

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Santee-Cooper River Power Project Upheld

The Fourth Federal Circuit Court of Appeals at Charlotte, N. C., affirmed last week a District Court decree denying to three power companies an injunction against the $37,500,000 Santee-Cooper power and navigation project in South Carolina.

Carolina Power & Light Company, South Carolina Power Company and South Carolina Electric & Gas Company contested the construction of the project to be financed with federal funds.

Public Works Administration officials in Washington declared that the opinion of the Circuit Court had cleared the way for construction of the project. They said that about $6,000,000 was now available.

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Budget Set at $2,986,000

Indianapolis Power & Light Company has announced a tentative construction budget for 1938 of $2,986,000 for completion of work carried over from last year, for enlargement and improvement of the C. C. Perry plant, for extension and improvement of the company's transmission and distribution system and for miscellaneous projects.

MODERN FACILITIES—Shops of the Commonwealth Edison Company transformed into the latest in facilities with air conditioning, high-intensity lighting and new fixtures for display and sales of electrical merchandise

Municipal Power Projects to Get Under Way Soon With PWA Funds

Administrator Ickes says steady flow of $99,637,952 in loans and grants will go for 61 projects in 21 states — Memphis to get first $1,000,000 voucher as part of a $3,092,000 grant for system

The pinch of subsidized government competition will soon be felt by public utilities as Public Works Administrator Harold L. Ickes begins the flow of $99,637,952 of PWA grants and loans to 61 public power projects in 21 states. There will be $61,225,544 of loans and $38,412,408 of outright grants.

The first $1,000,000 voucher goes to Memphis as the initial federal contribution to its $6,872,000 system to distribute TVA power. The PWA is contributing $3,092,000 as a grant to the project which will compete with Memphis Power & Light unless negotiations result in the city's purchase of the utility's property.

Work on Memphis system

Construction of substations and TVA transmission lines to the city's proposed system have been under way for about a year. It is expected that work on the Memphis system can be rushed, now that federal funds are available in addition to the local bond issue, so that power can be distributed before spring.

PWA officials declare that funds for other projects will begin to flow to communities so that work on power projects can get under way. It is estimated that the national program, when under way, will provide 146,917,808 man-hours of work at construction sites and 4½ man-hours "behind the line" for each man-hour on the job.

Eight applications for power have been received by the TVA since the act was upheld in the suit that was brought by eighteen southeastern power companies.

New applications

The new applications for power include Ellisville, Miss.; Bradford, Tenn.; Madisonville, Ky.; Norton, Big Stone Gap, Appalachia and Pennington Gap, Va., and Newbern, Tenn., the Authority announced.

Mayor Walter W. Mynatt of Knoxville, Tenn., stated last week that construction of the first unit of a municipal system to distribute TVA power would be started before February 15. City Council has unanimously approved the Mayor's recommendation that a contract be awarded. The Federal Engineering Corporation, Kansas City, Mo., was low bidder for the work with a bid of $138,369. It is expected that the distribution system can be ready by June 1. Knoxville has a $2,000,000 loan and $600,000 grant from the PWA for the system.

•

Utility Aids Sick Man; Sets New Power Line

Immediate action by Consumers Power Company brought comfort to David Hill, an 87-year-old farmer of Ada, Mich., critically ill with pneumonia, when five construction crews made a mile-long electric power line extension in eight hours.

Last week Dr. R. J. Hutchinson explained to John A. Cleveland, Grand Rapids manager of the utility, that his patient required a short-wave diathermy, but could not be moved from his isolated farm home.

Mr. Cleveland sent workmen to string the line immediately, although work on the line had been planned for spring. Tree-trimming crews cleared the path for the crews of more than forty men to erect poles and string line over icy hills. The job was completed in eight hours, a job usually requiring two days.

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TVA Rate Plus Taxes Urged for Alabama Power Company

Proposal that the Alabama Power Company reduce its rates to the "TVA rate plus taxes" was submitted to Thomas W. Martin, utility company president, last week by Gov. Bibb Graves of Alabama.

The reduction, if carried out by the utility, would effect savings of approximately $1,500,000 a year to customers of the company in Alabama. The Governor made the proposition that the power company reduce its rates to meet the TVA's "yardstick" schedule, but with allowances for the private utility's taxes paid to the state.

Governor Graves declined to comment on the proposal and Mr. Martin would not discuss subjects of the conference between them.

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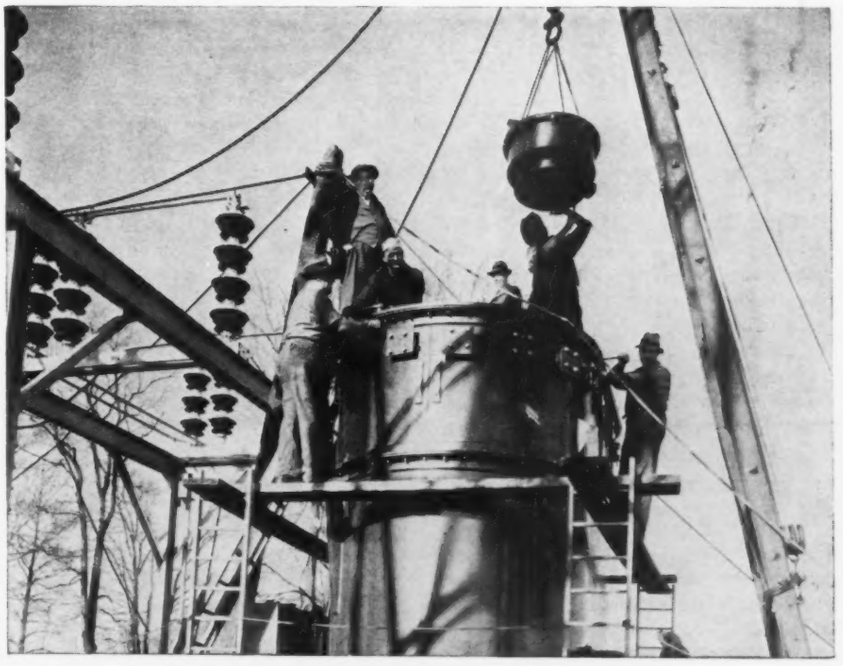
Rural Testimony Completed

Testimony has been completed in the hearing held by the West Virginia Public Service Commission to determine the status of the Harrison Rural Electrification Co-operative. After briefs have been presented the commission will hear oral arguments in Charleston.



SYSTEM GIANT—Largest of its kind in the Consolidated Edison Company of New York system, this 30,000-kva. polyphase transformer is being installed by Yonkers Electric Light & Power at the Dunwoodie station

Supreme Court Hears Utility Act Arguments

The government's hand-picked case against Electric Bond & Share and 26 affiliates to test the constitutionality of the public utility act came before the Supreme Court for argument this week. A seven-judge court will deliver the decision as Justice Cardozo is ill and Justice Reed left the bench when arguments opened. He was connected with the litigation while Solicitor-General.

When the government first instituted suit against Electric Bond & Share to force registration with the SEC under the provisions of the act strong indications were given that the act would be tested in its entirety. However, briefs and arguments before the courts narrowed the government's case to only the registration provisions which have so far been upheld. The utilities have sought a ruling on the entire act.

Thomas D. Thatcher, former Federal district judge at New York, opened the case for the utilities, declaring that the act "transcends all limits of proper regulation." He said that the measure "usurps the functions of management and the prerogatives of ownership."

Quotations from a report of the Federal Trade Commission used by government counsel were characterized as "generalization and not a finding of fact."

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Utility Agreement to Be Investigated

FPC has ordered an immediate investigation instituted to determine whether an agreement under which the Arkansas Power & Light Company and the Louisiana Power & Light Company purchase, sell and interchange electric energy between each other violates any of the provisions of the Federal Power Act or any rule, regulation or order of the commission thereunder.

The commission will place under particular scrutiny service schedule "B," the preferential provisions of which, the order of investigation states, "may adversely affect the utilization by Arkansas Power & Light Company of its hydro-electric generating facilities, some of which are under license from the commission and may constitute an agreement or arrangement to limit the output of electrical energy, to restrain trade, or to fix, maintain or increase prices for electrical energy or service in violation of the provisions of Section 10 (h) of the Federal Power Act and of the provisions of the license for Project No. 271 held by Arkansas Power & Light Company for the operation of two of the hydro-electric projects from which energy is to be procured under said Service Schedule 'B.'"

Arkansas Power & Light's project No. 271 is located on the Ouachita River and has a present installed generating capacity of 92,500 hp. Both of the companies are affiliated with Electric Bond & Share Company.

•

Power Rate Cut Made by Potomac Electric

Rate reductions to domestic and commercial customers of Potomac Electric Power Company aggregating $770,000 annually were approved last week by the District of Columbia Public Utilities Commission. The new rates, effective as of February 1, also reduce the base return to the company from 6½ to 6 per cent.

Domestic customers will enjoy a cut amounting to about 38 per cent of the total, or $294,000; commercial customers about 42 per cent, or $326,000, and the federal and district governments roughly 20 per cent, or $150,000.

The new domestic rate schedule follows:

	Old Rate, Cents	New Rate, Cents
First 50 kw.-hr.	3.9	3.9
Next 50	2.3	1.8
Next 100	1.8 }	1.5
All over 200	1.5 }	

The first block rate was retained in the new schedule for the company told the commission that the present rate was providing no more than cost for this service.

Since 1925 the utility has been operating under the sliding scale agreement, under the terms of which any return to the company in excess of a specified rate on its $73,792,841 valuation is shared with consumers by means of a rate cut for the following year. Under this agreement rates have been reduced every year since 1925.

•

City Unit Sale Considered

New York Public Service Commission's latest order to Endicott to reduce its municipal power rates has precipitated serious official consideration of a proposal to sell the municipal power plant to the New York State Electric & Gas Corporation. The estimated value of the plant is placed at approximately $300,000. Old village records show that once the utility offered the village $400,000 for the plant.

Canadian Engineers Meet in Montreal

The annual winter conference of the Canadian Electrical Association opened January 31 at the Windsor Hotel, Montreal, with some 240 delegates registered for the two-day meeting. R. H. Mather, president of the association and manager of the commercial and distribution department of the Shawinigan Water & Power Company, presided.

Activities during the first day centered in the 22 committee meetings and in the dinner that evening, at which George D. Leacock, president of the Moloney Electric Company of Canada, Toronto, was guest speaker.

On the second day a demonstration of artificial lighting was used to illustrate the address of S. K. Waldorf of the Pennsylvania Water & Power Company, Baltimore, on "Lightning Protection of Transmission Lines." Other papers read at the conference were: "Further Possibilities in Advertising and Sales Promotion for the Electrical Industry," by B. W. Keightley, Canadian Industries, Ltd., Montreal, and "Operation of Wood-Pole Lines at Higher Voltages," by A. E. Davison, Ontario Hydro Commission, Toronto.

In a brief presented to the Royal Commission, dealing with Dominion Provincial relations, the association declared: "A system of taxation which places a premium on individual governments and municipalities engaged in commercial activities at the expense of the taxpayers as a whole is obviously wrong in principle and should be changed."

The brief contained a vigorous protest against the growing tendency of governments to invade the field of private business. It was stated that such publicly owned utilities as the Ontario Hydro-Electric Commission, because they were exempt from federal or provincial taxation, were given an unfair advantage over privately owned power companies.

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Georgia Makes Appraisals

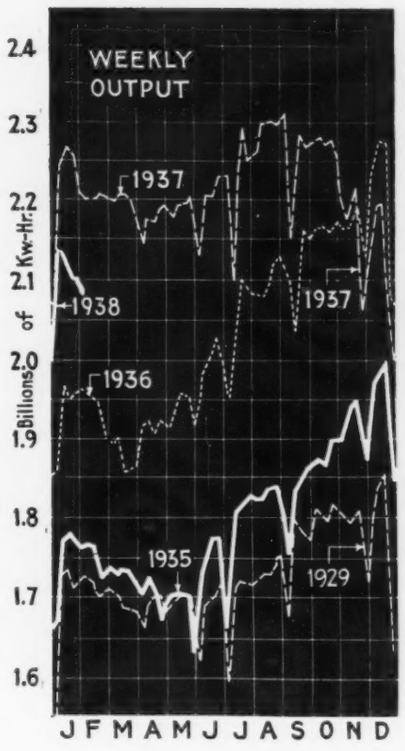
Georgia Public Service Commission has announced the creation of an appraisal division to determine the value of public utility properties in the state and has retained the services of Orin S. Vogel to conduct the appraisals. The first appraisal will be of the properties of the Georgia Power & Light Company. A rule *nisi* was recently issued against this company calling upon it to show cause, on February 15, why its rates should not be returnable before the commission.

Seasonal Decline Continues

Output falls slightly—5.4% under 1937—Coast gains—Industrial areas lag

Production of energy by the electric light and power industry during the week ended February 5 slipped off 0.8 per cent, compared with the preceding week, to 2,082,447,000 kw.-hr., according to the Edison Electric Institute. The decline from the high point in January has been somewhat less pronounced than it was a year ago, amounting to 57,000,000 kw.-hr., as against 63,000,000 kw.-hr. in 1937, but it has been steeper than in 1935 and 1936.

Operations continue lower than in the like period last year, but the disparity, 5.4 per cent, is somewhat smaller than it was in the middle of January, when it went up to 6.6 per cent. The poorest showing compared with 1937 continues to appear in New England and the Central region, with losses around 11 per cent. The Pacific is down only 1.3 per cent, against 5.9 per cent a week ago.



Per Cent Change from Previous Year

Region	Week Ending Feb. 5	Jan. 29	Jan. 22
New England	−11.5	−10.3	−12.0
Middle Atlantic	− 1.4	− 1.4	− 1.6
Central Industrial	−11.3	− 9.1	−12.3
West Central	− 2.7	− 1.2	− 0.5
Southern States	− 0.4	− 2.4	− 6.3
Rocky Mountain	− 1.4	− 1.8	+ 2.6
Pacific	− 1.3	− 5.9	− 4.1
United States	− 5.4	− 5.2	− 6.6

Weekly Output, Millions of Kw.-Hr.

1938	1937	1936
Feb. 5..2,082	Feb. 6..2,201	Feb. 1..1,963
Jan. 29..2,099	Jan. 30..2,215	Jan. 25..1,956
Jan. 22..2,109	Jan. 23..2,257	Jan. 18..1,950
Jan. 15..2,115	Jan. 16..2,264	Jan. 11..1,971
Jan. 8..2,140	Jan. 9..2,244	Jan. 4..1,855
Jan. 1..1,998	Jan. 2..2,069	
	1936	1935
	Dec. 26..2,081	Dec. 28..1,847

Fort Worth to Drop Utility Contract

Mayor W. J. Hammond has served notice on the Texas Electric Service Company that the city of Fort Worth will "cancel its electric power contract at the earliest possible time." Mayor Hammond recently conferred with officials of the Colorado River Authority at Austin for the purchase of 10,000,000 kw.-hr. a year to be generated by the new hydro-electric plants at the dams which the Authority is constructing on the Colorado River near Austin. It is proposed to construct a transmission line from the dams to Fort Worth and north Texas cities at an estimated cost of $2,000,000.

It is planned by Mayor Hammond to obtain funds aggregating approximately $3,000,000 from the PWA to build a distribution system in Fort Worth and sell power from the Colorado River Authority plants direct to industries and domestic consumers. Mayor Hammond said that he hopes to create an even larger market and to offset possible power failures by connecting municipal plants of north Texas into a league whereby emergency "stand-by" service would be available if needed.

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Issue Commercial Manual

Utah Power & Light Company has supplied its salesmen with a commercial-industrial sales manual in loose-leaf form. The book includes all information pertinent to commercial and industrial use of electricity.

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Heat Service to Continue

An increase of 20 cents on each step in the steam heating rate in Huntington will induce the Northern Indiana Power Company to continue heating service an extra year, L. B. Schiesz, vice-president, has announced, in response to requests by citizens for the continuance of the heating service which the utility announced it would abandon after this winter. The increase would raise the cost of the first 10,000 cu.ft. of condensation from 75 cents to 95 cents per thousand, the second step from 60 to 80 cents, and other steps accordingly.

•

Commission to Investigate Unlicensed Power Plant

Investigation has been instituted by the Federal Power Commission to determine whether the maintenance and operation of the Thompson Falls plant of the Montana Power Company, located on Clark Fork in Sanders County, Montana, without a license from the commission constitute a violation of any provision of the Federal Power Act or of any rule, regulation or order thereunder.

The order states that the plant appears to be located in part upon public lands of the United States and the commission records show that the 30,000 kw. hydro-electric development generated some 207,970,000 hw.-hr. of electric energy during 1937.

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Water Unit Must Obtain Separate Power License

Because the Pacific Gas & Electric Company has contracted to sell its Summerfield water system to the Mosquito District Mutual Water Company and to lease part of the system to that company pending consummation of the proposed sale, the Federal Power Commission has granted its application for amendment to its license for Project No. 78 so as to exclude from the project this water system on condition that the Mosquito District Company take out a separate license for the operation and maintenance of the system for power development.

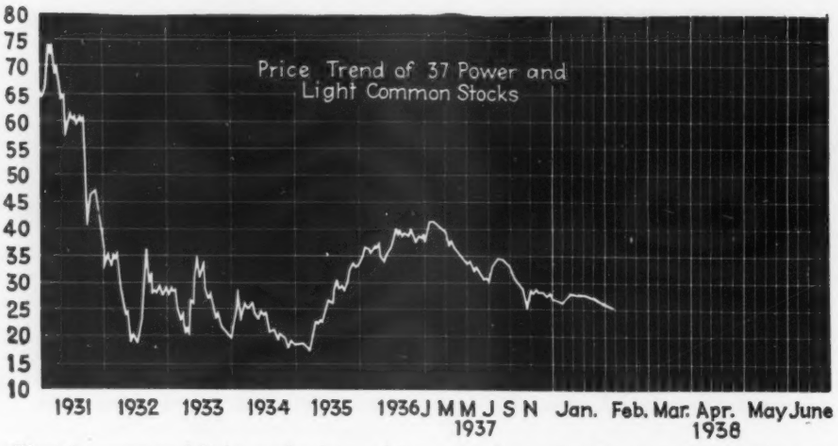
Under existing water rights the Summerfield system is capable of being operated for the development of power, and under the proposed disposition will continue to be operated by the Mosquito District Company for delivery of surplus water to Pacific Gas & Electric for that purpose.

•

Adds to Hydro Facilities

Carolina Aluminum Company, Badin, N. C., a subsidiary of the Aluminum Company of America, Inc., has awarded a contract to the Utah Construction Company, Ogden, for additions to its Santeetiah power dam, near Robbinsville, N. C., to provide for proposed additions to hydro-electric power facilities at that place. Work will be placed under way at once.

Stocks Drift Lower in Week



Electric power and light stocks dropped lower in the week, but showed indications on Tuesday of an upward movement, supporting an upswing in the general market. "Electrical World" index, 25.1; previous week, 25.6; corresponding week a year ago, 40.1

Commission Denies Refinancing Plan

Wisconsin Public Service Commission has announced that it has refused to approve a $14,000,000 refinancing plan proposed by the Northern States Power Company of Eau Claire.

"If the commission were to grant this application it would, in effect, be in the position of permitting innocent prospective purchasers to invest in securities of a corporation which the commission knows is grossly overcapitalized," the order of denial read in part.

The commission mentioned that the utility owes a sister company, the Northern States Power Company of Minnesota, $16,987,831, but promised that $5,480,000 of this debt would be canceled if the proposed refinancing were authorized. The commission contended that at least $10,222,000 must be canceled.

•

Utility Financing Totals $39,000,000 in January

Two electric light and power companies issued new securities during the month of January—Consolidated Edison of New York to the amount of $30,000,000 and Consumers Power Company to the amount of $9,000,000. Consolidated issue was in the form of 3½ per cent debentures, priced at 101¾; Consumers Power in the form of first mortgage 3½ per cent bonds priced at 102.

This total of $39,000,000 compares with $9,125,000 in December and $62,030,694 in January, 1937.

•

Ohio Company Calls Bonds

Ohio Public Service Company has called for redemption March 1 at 107½ and accrued interest all outstanding first mortgage and refunding 6 per cent bonds, series C, due March 1, 1953.

•

Stock Auction Deferred

Sale at auction of 712,411 shares of Jersey Central Power & Light Company common stock, collateral supporting National Public Service Corporation debentures, has been postponed by the trustee, New York Trust Company, from Jan. 28 to March 23.

Postponement was ordered to permit the New York State Court of Appeals to hear the appeal of New Jersey Power & Light Company, Associated Gas & Electric Company subsidiary, from lower court decisions denying the petition of New Jersey Power & Light for a pro rata distribution of the shares to holders of National Public Service debentures.

•

Edison Loan's Cost Hit by Maltbie

Commenting on the recently issued $30,000,000 issue of Consolidated Edison Company of New York of 3½ per cent debentures, Milo R. Maltbie, chairman of the New York Public Service Commission, declared that the company's estimated figures for expenses in the issuance of the debentures were "unnecessarily large."

"The commission is not convinced," Mr. Maltbie stated, "of the necessity of such expenses." He added: "Further, only expenses relating to this issue can be charged to it; all costs relating to the former $80,000,000 application, particularly those that have to do with the $60,000,000 of refunding bonds, now abandoned, should be charged to surplus."

Expenses in connection with the issuance and sale of the $30,000,000 issue, according to the application filed with the commission, would approximate $197,000, the largest single item, $42,000 being for accounting services. These expenses, Mr. Maltbie declared, if in excess of reasonable amounts, should not be paid, "and if they are or have been paid, may not be charged to the cost of this issue."

Earnings Reports (Utilities)

	Net Income 1937	1936
*United Gas Improvement	$28,150,550	$27,953,755
*Comm. & South. and subs.	15,124,836	13,349,811
*Cons. G.E.L.&P. Balti. and sub.	6,516,403	6,394,688
*Engineers Pub. Serv. and subs.	3,768,777	2,946,392
*Consumers Power	10,025,848	9,035,651
*Ohio Edison	4,733,175	4,185,582
*Virginia Elec. & Pwr.	3,394,516	3,153,506
*Puget Sound Pwr. & Lt.	1,771,607	1,662,600
*Gulf States Utilities	1,199,294	890,250
*Alabama Power	3,886,340	3,633,615
*Georgia Power	4,974,335	5,050,792
*Tennessee Elec. Pwr.	2,601,259	2,300,391

* Twelve months ended December 31.

New Issues of Electric Light and Power Securities in January

Name of Company	Amount (Par Value)	Offered to	Period	Class	Purpose	Interest Rate	Price	Per Cent Yield
Consolidated Edison Co.	$30,000,000	Public	20	Debentures	To reimburse treasury and for construction and extensions	3½	101¾	3½
Consumers Power Co.	9,000,000	Public	30	First mortgage bonds	Property additions	3½	102	3.39
Total	$39,000,000							

Utility Authorized to Keep Property

An order was entered by the United States District Court for the District of Delaware at Wilmington last week continuing Mountain States Power Company in possession of its property under a petition for reorganization filed by the company on December 31, 1937, under Section 77B of the federal bankruptcy act, according to a statement by Z. E. Merrill, president of the company.

That petition recited the inability of the company, although solvent, to meet the maturity of its first mortgage gold bonds, series A 5 per cent and series B 6 per cent, totaling $8,182,250, which were due January 1, 1938. On December 31 the court authorized the company to pay its bond interest which was due January 1.

Two committees representing bondholders and preferred stockholders of the company appeared at the hearing, asking permission to intervene in the reorganization proceedings and this permission was granted by the court.

•

Byllesby Probe Ordered

Investigation of H. M. Byllesby & Company, Chicago, has been ordered by the Wisconsin Banking Commission. At the request of special state attorneys, the commission set February 15 for a public hearing "to determine why and to whom Byllesby utility system paid substantial sums of money in connection with the acquisition of a public utility in Wisconsin."

Attorneys who requested the hearing said they had learned that William M. Dinneen, formerly secretary of the State Public Service Commission, borrowed and never repaid $18,500 from the late Halford Erickson, who was a Byllesby official. The commission announced that at the hearing it would consider the "advisability" of renewing the Byllesby Company's license to sell securities in Wisconsin.

•

$2,000,000 Electric System for New York World's Fair

A $2,000,000 electric power transmission system is being installed for the New York World's Fair, 1939, according to an announcement by Grover A. Whalen, president of the Fair Corporation. Plans call for a north unit and a south unit, each with feeders from the Hamilton Street, Brooklyn, and the Hell Gate power stations of the Consolidated Edison Company. The substations on the fair grounds are being erected following the signing of power contracts with the New York & Queens Electric Light & Power Company and affiliates.

The north and south units of the transmission system will each be composed of one 15,000-kva. and three 10,000-kva. transformers fed on the primary side by 27,000 volts, which energy is to be stepped down to 4,150 volts for distribution throughout the fair grounds.

•

Gatineau Power Plans Spending of $750,000

Gatineau Power Company has applied to the Provincial Electricity Board of Quebec for approval of plans to spend about $750,000 this year for additional generating and transmission facilities. The additions are to be financed out of earnings and cash on hand.

The principal item will be an additional 60-cycle, 34,000-hp. generating unit at the Chelsea hydro-electric plant on the Gatineau River 6 miles north of Ottawa. This will be the fifth 34,000-hp. unit at Chelsea and will complete that station to its full designed capacity of 170,000 hp.

The other major item will be a second 110,000-volt circuit to be added to the existing 6-mile transmission line from the company's Farmers hydro-electric plant, a mile south of Chelsea, to its Val Tetreau switching station in Hull, P. Q.

It was stated by the company that with new peak load and the increased demand under the revised contracts with the commission it is desirable at this time to make provision for additional generating and transmission capacity.

•

Tomahawk Hearing Deferred

FPC has adopted an order further continuing to February 24 the hearing previously set for February 10 on the declaration of intention filed by the Wisconsin Public Service Corporation to reconstruct the power plant and existing timber and rock-fill dam on the Wisconsin River at Tomahawk, Lincoln County.

•

Asks Report on Project

Representative Vincent F. Harrington of Iowa has introduced a resolution directing the Secretary of War to report on a multi-purpose irrigation, navigation, flood control and power project on the Missouri River at Yankton, S. D. The report would include full plans for development and cost estimates.

Customer Gain Shown by Hartford Electric

Hartford Electric Light Company's domestic customers used an average of 1,192 kw.-hr. each in 1937 at a consumer rate of 3.52 cents, representing a reduction on this volume of service of $600,000 in the past three years, President V. E. Bird announced at the annual meeting last week. He said earnings after taxes totaled $2,769,736, against $2,554,437 in 1936, and that the addition to surplus was $209,485, contrasted with a decrease of $19,707 a year ago on account of the flood.

Total electric revenue was $7,744,370, against $7,546,776 in 1936, a gain of 2.6 per cent. This was in face of increased costs of fuel, labor and taxes, the last named now totaling $996,000, or more than one-sixth of the gross. This heavy tax burden, Mr. Bird said, "must be recognized as a reason why prices cannot be reduced to the extent that the growth of business and the economies effected in operation would otherwise make possible. This fact must be kept in mind in case progress toward lower prices may seem less rapid than expected or desired."

President Bird pointed out that increased fuel prices will have to be contended with this year as established by the Bituminous Coal Commission. The situation, he said, will require the practice of the maximum economy consistent with good service. "Under these circumstances the improved efficiency of the new turbine and boiler at the South Meadow plant (a 40,000-kw. unit) will be a most welcome aid in holding down production costs in the latter part of 1938."

Last year the company added 1,295 electric ranges, 409 water heaters and 6,834 electric refrigerators to its system. The ratio of domestic sales to total sales was 38.2 per cent, against 26.4 per cent fifteen years ago. Domestic customers received in 1937 almost four times the amount of service as in 1923 and at half the unit cost. The average consumption was 318 kw.-hr. per domestic customer in 1923 and the rate 8.1 cents. All-electric home rates now in effect will save residential customers previously ineligible to them about $50,000 a year.

•

Rate Hearing Postponed

To permit additional evidence to be gathered, the Tennessee Public Utilities Commission has postponed the Kentucky-Tennessee Light & Power Company electric rate reduction hearing from February 15 to March 1.

New Rate Suspended by Power Commission

Back in September, 1929, Kentucky Utilities Company entered into an agreement whereby it would supply electric energy in interstate commerce to the Tennessee Electric Power Company.

Under date of Oct. 1, 1937, these companies entered into a proposed new agreement canceling and superseding the 1929 agreement, as amended, thereby effecting a change in rates, charges, classifications and service. On Dec. 14, 1937, Kentucky Utilities filed copies of the proposed agreement and rate changes with the Federal Power Commission.

Viewing the new agreement, which involves an increase in charges, the Federal Power Commission has decided that, under its authority, it needs more information from Kentucky Utilities "to determine the lawfulness of the rates and charges therein contained."

The commission also finds that a "hearing is necessary and desirable concerning the lawfulness of the rates, charges, classifications and service covered by the proposed schedule, which should be suspended in the public interest and the use of the proposed rates should be deferred for such time as is necessary to enable the commission to make a determination thereon."

With this order, the commission has suspended the rates, charges and service provided for the period from January 13 to May 13. The commission is to hold hearings "at such time and place as may be convenient to the commission upon reasonable notice."

•

Hearing to Be Resumed

Federal Power Commission has announced that hearing will be resumed on February 28 in Chicago, Ill., on the applications of eight Standard Power & Light Corporation system officials for authority to hold certain interlocking positions within that holding company system. The applications set for hearing are those of Bernard F. Braheney, Paul A. Lehmkuhl, Bernard W. Lynch, James J. Madden, Walter J. Maloney, Matthew A. Morrison, Thomas B. Wilson and Henry C. Cummins.

•

Prepares Sound Slide Film for Utility Presentations

A sound slide film, "Light on Power" has been prepared by the Vocafilm Corporation, 424 Madison Avenue, New York, N. Y., and is being offered by them to electric light and power companies for presentation to employees as well as to the general public through service clubs and other gatherings.

The company has also released a companion booklet showing the actual pictures and actual dialogue used in the film to leave with employees and others who attend showings of the film. Film is designed to interpret some of the current problems facing the electric industry.

•

Lansdale Plant Expansion

Increased demands for electric service during the past year has necessitated the general expansion program now under way at the Lansdale, Pa., municipal electric light plant. A $94,715 contract for boiler room equipment, steam generating unit and a coal pulverizer has been awarded the Riley Stoker Corporation and the material will be installed in the new boiler house addition within seven months.

Meetings

American Institute of Mining and Metallurgical Engineers—Annual meeting, February 14-17, New York, N. Y. A. H. Parsons, secretary, 29 West 39th Street, New York.

American Society for Testing Materials—Regional meeting, Seneca Hotel, Rochester, N. Y., March 9; Committee Week, Seneca Hotel, Rochester, March 7-11. R. E. Hess, assistant secretary, 260 South Broad St., Philadelphia, Pa.

Oklahoma Utilities Association — Annual meeting, Biltmore Hotel, Oklahoma City, Okla., March 21-22. Kate A. Niblack, acting secretary, Oklahoma Utilities Association, 625-626 Biltmore Hotel, Oklahoma City.

Edison Electric Institute—Sales committee, Edgewater Beach Hotel, Chicago, Ill., March 28-31.

Midwest Power Conference—La Salle Hotel, Chicago, Ill., April 13-15. L. E. Grinter, Dean, Graduate Division, Armour Institute of Technology, Chicago.

Missouri Association of Public Utilities—Annual convention, Jefferson Hotel, St. Louis, Mo., April 20-22. Jesse Blythe, assistant secretary, Merchants Bank Bldg., Jefferson City, Mo.

Northwest Electric Light and Power Association—Annual conference, business development section, Medford, Ore., March 16-18. Annual meeting, engineering and operation section, Vancouver, B. C., April 20-23. Berkley Snow, executive secretary, 707 Spalding Bldg., Portland, Ore.

Electrochemical Society—Spring meeting, Savannah, Ga., April 27-30. Dr. Colin G. Fink, secretary, Columbia University, New York.

Middle West to Buy Loan Collateral

Middle West Corporation has asked SEC approval for the acquisition of securities of Central and South West Utilities Company and North American Light & Power Company.

The securities for which applications were filed, consisting of 280,269 common shares of Central and South West Utilities and 36,077 common shares of North American Light & Power Company, are now held by Middle West Corporation as collateral for the loan of other securities. These other securities were loaned by Middle West Utilities Company, predecessor of Middle West Corporation, to Insull Utility Investments, Inc., and Corporation Securities Company of Chicago.

In its application Middle West states that these other securities have been pledged with certain banks in New York and Chicago as collateral security for indebtedness and cannot now be returned by the respective pledgors or their trustees in bankruptcy. In settlement, Middle West proposes to acquire the securities covered by the application and the banks will pay an additional sum of $35,000 in cash.

•

B. C. Electric Opens Drive on Portable Wall-Lamps

Sale of 2,500 indirect portable wall lamps during the months of January and February has been set as the objective of a campaign launched by the British Columbia Electric Railway Company in conjunction with electrical contractors and dealers.

This is the first occasion on which the co-operative idea has been applied to such a low price line, but if the campaign is successful other minor appliances will be featured on the same basis in the future. The lamps are priced at $4.95, with a down payment of 45 cents and the balance in monthly installments on the light bills of B.C. Electric customers.

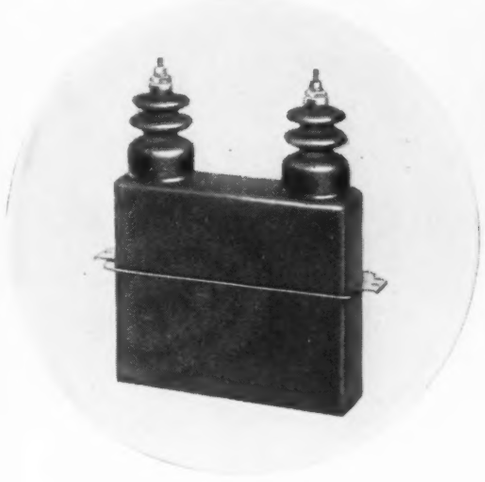
The financing is handled by the utility, which delivers the unit and pays the dealer or contractor a bonus of 75 cents for each order taken.

•

Revises Safety Code

A revision of the National Electrical Safety Code (Fourth Edition) is now actively under way. This is the first revision of this code that has been undertaken since the completion of revision of the third edition in 1926. This current revision is under a sectional committee of the American Standards Association, with the National Bureau of Standards as sponsor.

IVORY SOAP
99 44/100% PURE



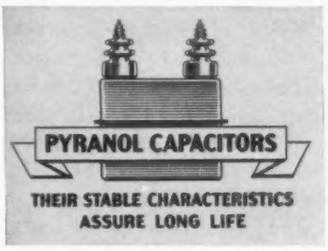
PYRANOL
CAPACITORS
99 45/100% PERFORMANCE
RECORD

YOU can install Pyranol capacitors on your most vital circuits with absolute confidence.

As a company, we take pride in the quality we build into all of our apparatus—and in the performance it renders our customers. Yet no product we build will give you a finer operating record than these modern, lightweight Pyranol capacitors.

Pyranol has revolutionized the design of capacitors and greatly extended their application. Industrial plants have bought them in increasing numbers for power-factor improvement because they are non-inflammable and nonexplosive. Utility operators particularly appreciate the stable characteristics of Pyranol, which assure long life and dependable operation. Specify Pyranol capacitors always for your most important circuits.

General Electric Company, Schenectady, New York.



GENERAL ELECTRIC

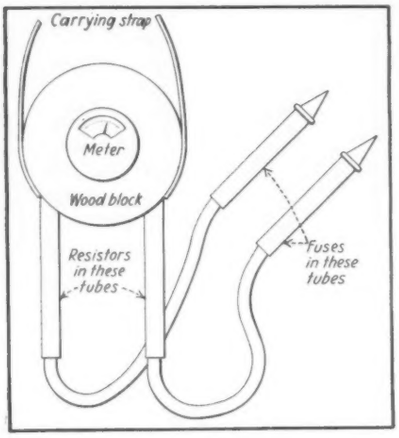
360-134

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Measure High Voltage Without Transformer

Frequently the need arises on power supply systems for an easily portable voltmeter for potential measurements on fairly high-voltage lines. The condenser type of instrument, while convenient to carry and to use, leaves something to be desired in the way of accuracy and



Direct-reading, high-potential, portable voltmeter

the ordinary induction meter requires an accompanying transformer, which encumbers the operator. To get around these deficiencies a direct-reading, high-potential voltmeter has been assembled in the company meter department for use on the Milwaukee Electric Railway & Light system.

The instrument is as shown in the accompanying sketch. The meter itself, mounted in a circular block of treated wood with a carrying strap around it, is a one milliampere a.c. milliameter with a scale calibrated in kilovolts. In the two fiber tubes extending from the circular block are resistors of proper value to give full scale deflection on the meter at 5,000 volts. The leads from the tubes are extra-flexible cable heavily insulated in rubber. The leads terminate in another pair of tubes which carry the contact points and in which are contained fuses of No. 40 "Nichrome" wire. When using the meter the operator wears rubber gloves and employs all other protective means for hot line work.

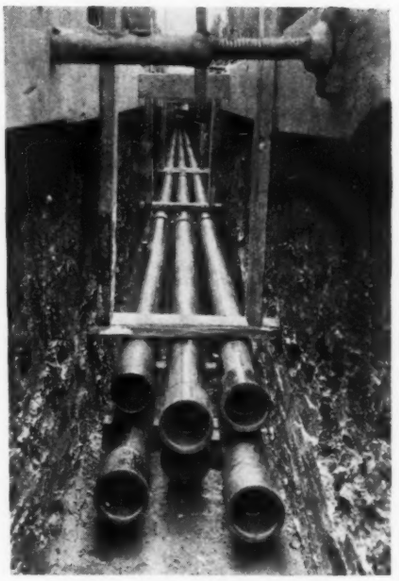
•

Watertight Joint for Fiber Conduit

By H. G. HALL
Superintendent Underground Lines, Detroit Edison Company

Since many cable failures have been traced to the corrosive action of ground waters on the lead sheath, it is becoming decidedly important to prevent the seepage of water into the conduit system. Although a conduit system may become flooded at intervals of high water, if it is graded so that it drains when the flood condition is relieved there is much less danger of sheath damage than if the water is allowed to seep continually through onto the cable or when it is allowed to stand in pockets along the conduit line.

With these conditions in mind a new type of coupling was designed and has been in use for some time on the underground system of the Detroit Edison Company. To the standard drive-joint coupling has been added two cork gaskets set in annular grooves near the outer ends of the coupling and projecting



Cork gasket conduit coupling makes duct watertight

The gasketed coupling requires no paint or compound in the joint. The coupling and conduit do not have to be in alignment and the presence of dirt on the conduit at the tapered end or on the inside of the coupling does not prevent the conduit being driven into the coupling far enough to make a watertight joint. Increases cost only one-half of 1 per cent of total.

into it. As the conduit is driven into the coupling the cork is compressed, making a watertight joint.

The coupling was designed to overcome the difficulty of securing a watertight joint due to dirt adhering to the joint surfaces or the conduit not being driven squarely into the

RECOVERED—$4,000 LOST REVENUE

Service Greatly Improved

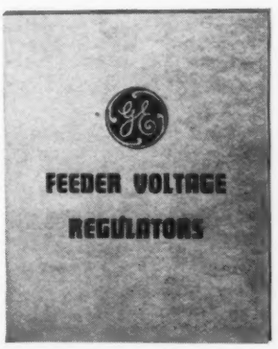
The experience of one power company after installing G-E Voltage Regulators

WHEN increasing loads brought poor voltage conditions on four of its rural circuits, the Yamhill Electric Company of Newburg, Ore., met the situation by installing four G-E branch-feeder step voltage regulators, at an installed cost of $1,000 each.

As a result, annual revenue from these circuits jumped from $40,000 to $44,000. Approximately half of this difference resulted from improved voltage; the remainder from new load made possible by the additional capacity of the lines.

In addition, customers of this utility are enjoying vastly improved service since the installation of the regulators.

You may have circuits on your systems that offer similar opportunities for applications of G-E regulators at a profit to both your customers and yourself. The complete G-E line of regulating equipment makes it possible to regulate for all areas and all load densities in the most economical manner. Ask your G-E representative for complete information, or write for our Catalog GEA-2762 on "Feeder Voltage Regulators." Address Dept. 6—201, General Electric Company, Schenectady, New York.



Improved service—increased revenue. One of four G-E single-phase, branch-feeder step voltage regulators installed on rural circuits of Yamhill Electric Company, Newburg, Ore.

"Investment Fully Justified,"
says Vice President and Manager

Speaking of the performance of the four G-E regulators installed in 1936, Mr. A. L. Strickland, Vice President and Manager of the Yamhill Electric Company, says: "Our experience with these regulators has been very satisfactory, and—particularly on our class of long rural lines—we find this equipment maintains a satisfactory standard of voltage regulation. Its performance fully justifies our investment."

GENERAL ELECTRIC

Filing No. 5400

350-138

coupling. With the gasketed coupling it is possible to turn long radius curves in the conduit without admission of seepage through the joints.

We have installed approximately 100,000 ft. of conduit using this joint and since the additional cost amounts to about one-half of 1 per cent of the total cost we have adopted it as standard construction.

•

Voltmeter Gives D. C. Insulation Resistance

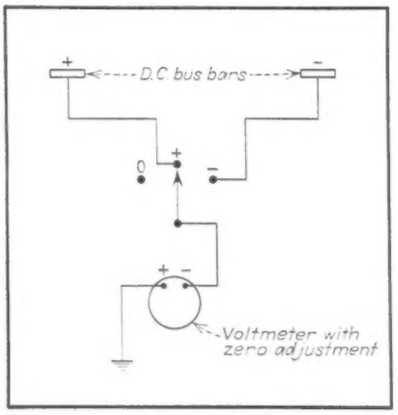
By G. W. STUBBINGS
Winchester, England

Values of insulation resistance of isolated two-wire d.c. systems are obtained in the trolley bus substations of the London (England) Passenger Transport Board by use of a direct-reading insulation meter which allows insulation resistance values to be logged directly as read without calculation or chart reference.

By measuring voltage between the two poles of a two-wire d.c. supply system and ground, insulation resistance can be obtained without interrupting service. If the voltmeter resistance is r, and the readings when it is connected to the positive and negative poles are respectively v_1 and v_2, then the combined insulation resistance of the system, R, is given by the equation $R = r\left(\frac{V}{v} - 1\right)$ where $v = v_1 + v_2$ and V is the busbar voltage.

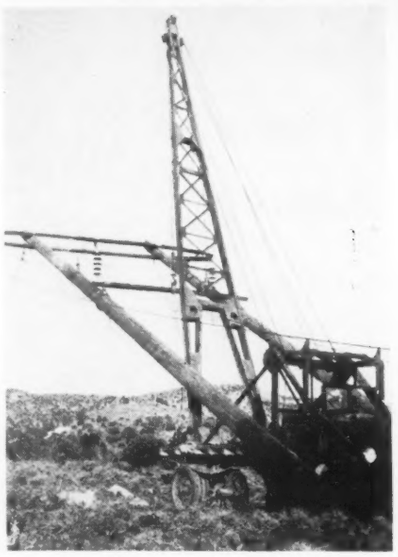
An ordinary d.c. voltmeter slightly modified by the provision of an external knob for zero setting and having an additional ohm scale is used. The voltmeter has its positive terminal connected to earth. Assuming that the pointer stands at zero with the instrument disconnected, the pointer will tend to deflect to the left of zero by an amount equal to v_1, when connected to the positive pole of the d.c. system. While the instrument is so connected let the pointer be brought to zero by the zero adjuster. When the instrument is disconnected the pointer will move to the right and will indicate on the volt scale the value of v_1. If the instrument is now connected to the negative main the pointer will deflect further to the right by an amount corresponding to v_2. The total deflection from zero will now correspond to $v_1 + v_2$ or to v in the above equation.

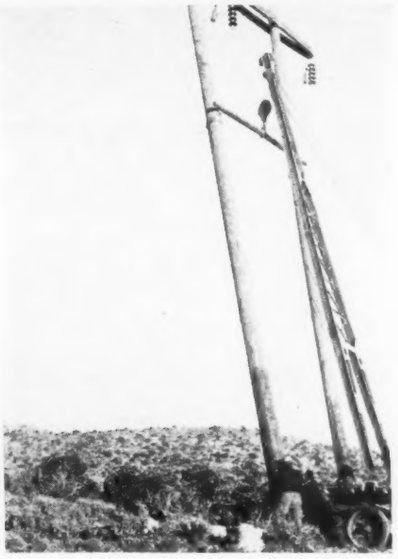
If the instrument is provided with an additional scale which gives ohms in terms of v and V the final position of the pointer will indicate the value of the insulation resistance directly, provided that the actual value of the supply voltage corresponds to the value V, for which the ohm scale has been drawn. The ohm scale can easily be marked by the use of a transformation of the above equation which gives $v = V\left(\frac{r}{R + r}\right)$



Direct-current voltmeter with extra scale gives direct reading of insulation resistance without service interruption

ERECTING H-FRAMES ON BOULDER-PIOCHE LINE





Although steel-tower construction is used on the first 1½ miles of the 165-mile Boulder-Pioche line, recently energized temporarily at 69 kv., woodpole construction is used on a large part of the line which will eventually operate at 139 kv. In building this portion of the line the H-frames used were assembled on the ground complete to sagging blocks and conductors and raised into position as shown.

Top—Assembled structure ready to lift. Note the conductors in the sagging blocks.

Left—Structure part way up, conductors now swing clear. The truck has moved ahead slightly to spot the butts at the pole holes.

Right—Lifted free, the 50-ft. poles are ready to settle into place.

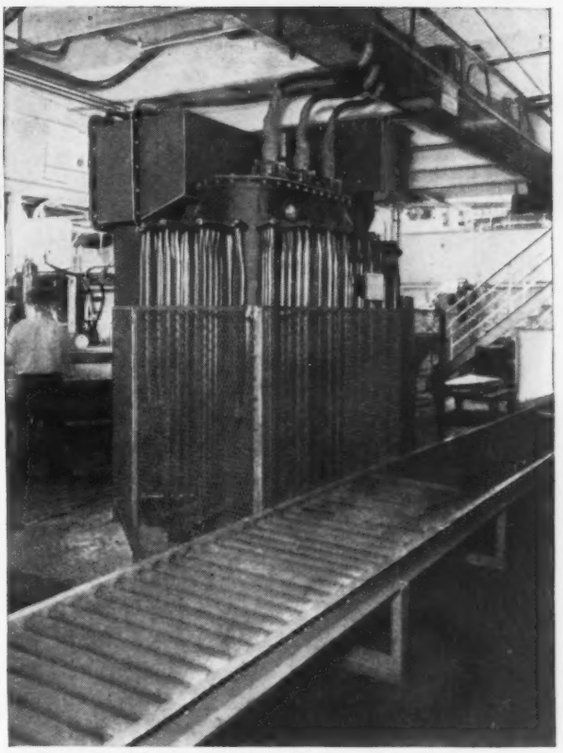
•

Fight Marine Borers at L Street Station

Marine borer activity in Boston Harbor during the past six years has cost owners of waterfront structures in the vicinity of $1,000,000 for reconstruction of wharves, bulkheads

Pyranol Transformers

SAFETY FURTHER RECOGNIZED BY NATIONAL ELECTRICAL CODE



Savings in installation costs, plus the advantages of putting the transformer near the load center, are two of the benefits of using a Pyranol transformer in this industrial plant. Because Pyranol is nonexplosive and noninflammable, it eliminates the expense of a fireproof vault.

STRIKING evidence of the increasing appreciation of the safety of Pyranol transformers for indoor installations is seen in the 1937 revision of the National Electrical Code. We quote from Article 450, Section 4503, pages 162 and 163.

"b. LIQUID THAT WILL NOT BURN. A transformer filled with an approved liquid that will not burn and rated in excess of 25 kva shall comply with one of the following conditions:

"1. It shall be installed in a metal pan or concrete basin large enough to retain the liquid from the largest transformer involved; or

"2. It shall be furnished with a means for absorbing any gases generated by arcing inside the case; or

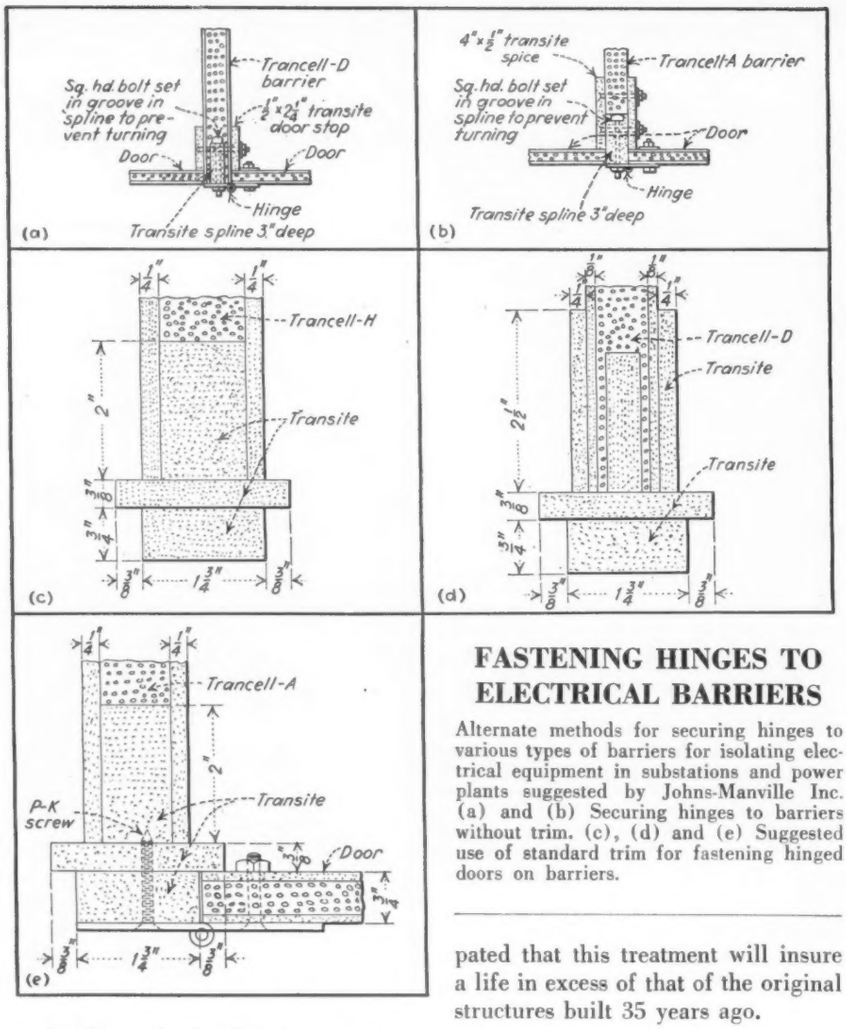
"3. It shall be furnished with a pressure-relief vent and if in a poorly ventilated place shall be connected to a chimney or flue which will carry such gases outside the building."

Note that no expensive enclosing vault is needed—not even a metal pan or concrete basin if the transformer is furnished with a pressure relief vent. G-E Pyranol transformers have a relief diaphragm for this purpose. Furthermore, in a well-ventilated building, with the approval of your local authority, this vent (diaphragm) need not even be connected to a chimney or flue. Accordingly, you can place your transformers right at the load center, eliminate vaults, save long runs of secondary cable, and get good regulation and performance at sharply reduced costs.

In a nutshell, the approval of your installation of Pyranol transformers is greatly facilitated by the new provisions of the Code. General Electric, Schenectady, New York.

GENERAL ELECTRIC

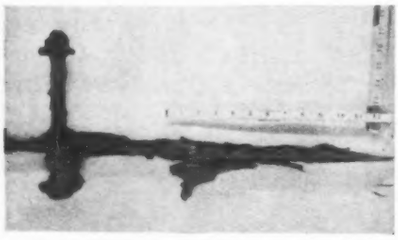
300-66



FASTENING HINGES TO ELECTRICAL BARRIERS

Alternate methods for securing hinges to various types of barriers for isolating electrical equipment in substations and power plants suggested by Johns-Manville Inc. (a) and (b) Securing hinges to barriers without trim. (c), (d) and (e) Suggested use of standard trim for fastening hinged doors on barriers.

and piling. At its L Street station the Boston Edison Company has recently rebuilt a timber sea wall, deflecting bulkhead and intake racks with timbered structures associated with the separation of condenser water intake and discharge. The major portion of the coal wharf has also been rebuilt. The total cost of the work has been approximately $150,000. The company's engineers have adopted impregnation with 22 pounds per cubic foot of 80 per cent creosote and 20 per cent coal tar to protect these structures. It is anticipated that this treatment will insure a life in excess of that of the original structures built 35 years ago.



Wooden pile reduced to skeleton of former thickness by marine borers

The distance between the bolt head and washer measures the original diameter of the pile.

•

Fluid Pressure Test Locates Oil Leaks

A method of fluid pressure testing of vault and submersible type distribution transformers and other network equipment which it is said will tend to limit transformer failures caused by defective or leaky transformer tanks has been adopted as standard practice by the Consolidated Edison Company of New York, Inc. The method won an employee-suggestion prize for Robert C. Robson of the company's station construction and shop department. On one occasion a leak in a submersible protector housing that was not located in ten days by using soap suds was found in three minutes by the oil pressure test method.

Test equipment consists of a ⅛-in. pressed steel cylindrical tank 11 in. in diameter and 18 in. long, with a flush type fluid gauge and a Waterbury fitting for a pressure gauge installed at the ends of the tank. In the center of the tank bottom a 1-in. brass pipe is brazed. This is about 12 in. long with a 1-in. union in the center or 6 in. from each end of the pipe. This arrangement is convenient for installing the pressure tank in a horizontal position over any piece of equipment, with the pipe extension fitting into the top of the equipment to be pressure tested.

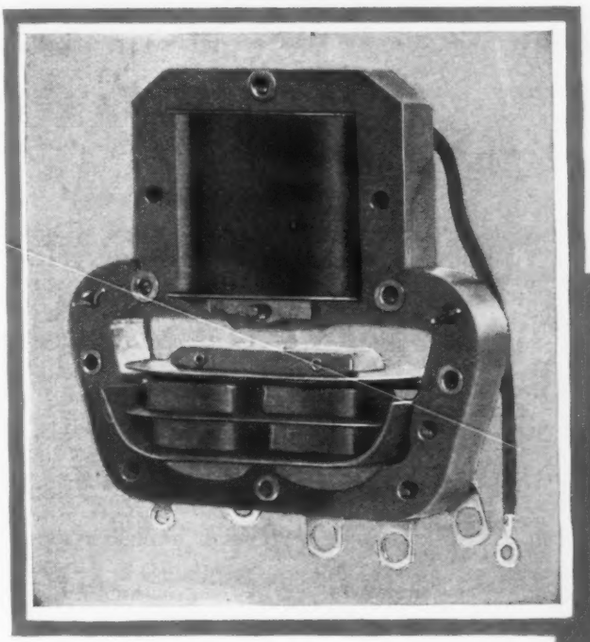
The pressure tank is installed in the main cover of the equipment under test. A pressure gauge is connected to the Waterbury fitting with a vent cap inserted in the gauge. Fluid (oil or some non-inflammable liquid such as Pyranol, according to the type of transformer) is pumped into the main tank of the transformer until the fluid level shows in the flush type gauge of the pressure tank. The vent cap is then removed and fluid is pumped until a pressure of 7 lb. shows on the pressure gauge. The fluid level will be about the center of the pressure tank when the required 7 lb. pressure is shown on the gauge thereby reducing the air volume in the pressure tank to a minimum, so that a very slight leak and loss of fluid will make a relatively large change in volume compared to previous methods and will result in a noticeable change in the pressure gauge reading.

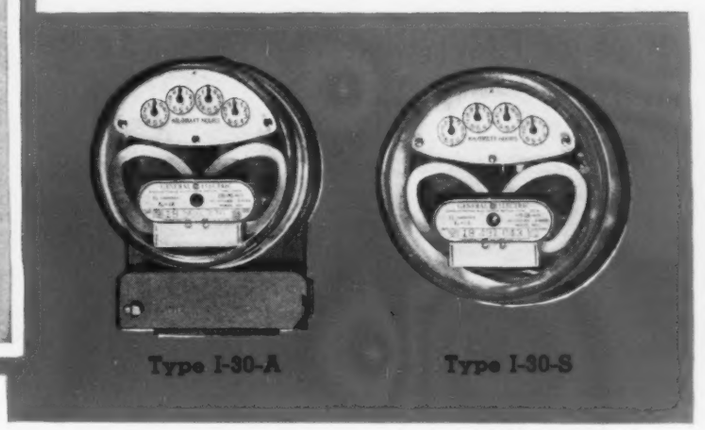
Advantage of the fluid pressure test method is that all gaskets, cover bolts, fittings, welded seams, cooling tubes, etc., are under fluid pressure.

Fluid pressure test for vault and submersible distribution transformers replaces soap suds for locating stubborn tank leaks

Designer is shown with his apparatus.

THIS ELEMENT *"Makes"* the WIDE-LIMIT METER





THE driving element of the G-E Type I-30 watthour meter, more than any other feature, makes possible the straight-line characteristics between the wide-apart limits of 0.5 and 60 amperes.

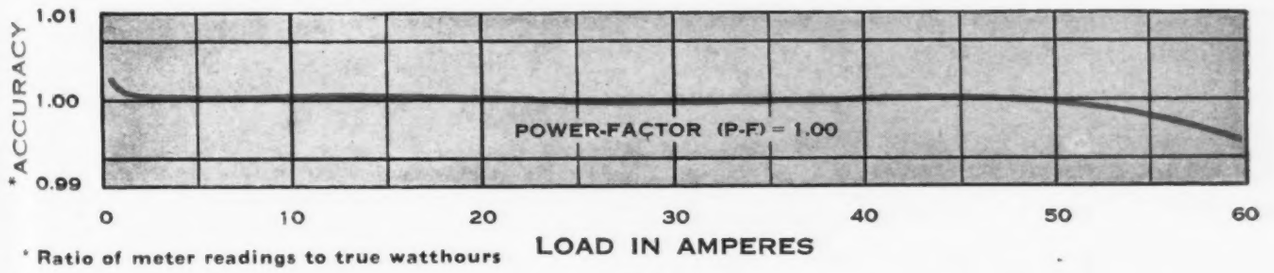
First of all, the I-30 meter—even when uncompensated—is remarkably accurate. It is the driving element that contributes most to this inherent accuracy. As a result of its fundamentally correct design, the errors caused by variations in load, voltage, temperature, power-factor, and frequency are negligible, and only slight compensations are needed.

The load shunt, which is incorporated as a part of the driving element, not only compensates for heavy-load droop, but also improves performance at light loads, so that the resulting load curve is accurate to lower values of current.

Other refinements in design—such as new light-load and lag adjustments and compensation for Class 1 and Class 2 temperature errors—add to the ability of the I-30 meter to handle accurately loads that vary widely, and help toward making it suitable for very broad applications.

If you should like to know more about the I-30, we shall be glad to send a copy of Bulletin GEA-2721. Or you may prefer to call in a G-E meter specialist. Address the nearest G-E sales office, or General Electric Company, Dept. 6—201, Schenectady, New York.

AVERAGE LOAD CURVE OF 15-AMPERE, 240-VOLT, 3-WIRE, 60-CYCLE, TYPE I-30 WATTHOUR METER



* Ratio of meter readings to true watthours

GENERAL ELECTRIC

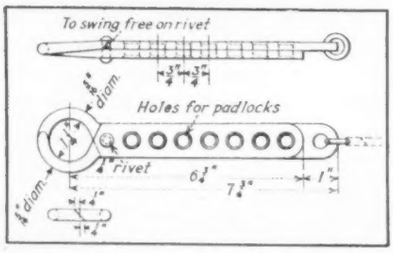
400-29

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Protect Electricians With Multiple Locks

Maintenance workmen at the Southwestern Portland Cement Company, Victorville, Calif., may go about their jobs without fear that some one will inadvertently start the machine they're working on. This protection is afforded by a simple pair of safety-locking tongs. The tongs, used to lock switches in the open position, have holes in the handles to accommodate several padlocks.



Locking tongs secured by individual padlock of each man working on "dead" circuit

Diagram shows tong details

All men working on a circuit are required to place their individual padlock in the tongs before starting on the job. In this way no workman is left unprotected through another workman's being taken off the job—his padlock with him. Extensions are provided so that an indefinite number of padlocks can be accommodated. In so far as the operation of this device is concerned, a perfect record over several months attests its value.

•

Shift Plant Schedule to Reduce Demands

By CHARLES R. RIGGLE

Ohio Edison Company, Youngstown, Ohio

When load charts for six months' operation of a plant making cold-drawn steel were examined by power sales engineers of the Ohio Edison Company during the course of an investigation of the plant's operations it was found load was fairly uniform for 24 or 25 days out of the month. Excessive demands occurring four or five days a month, at irregular intervals and for periods ranging from 15 minutes to 45 minutes, caused an increase in power costs and a high net rate per kilowatt-hour that had brought about this customer's interest in local power generation by steam.

Analysis of the daily load curves with the plant superintendent and comparison with the daily operations disclosed that a rod-straightening machine and a large draw bench were in operation at the times the demand jumped up. When this was pointed out, the superintendent readily recognized this as the source of trouble. It was learned that this equipment could be operated at times when other departments were operating at light load, and in this way the load could be made more uniform. Upon the power salesman's recommendation, the change was made.

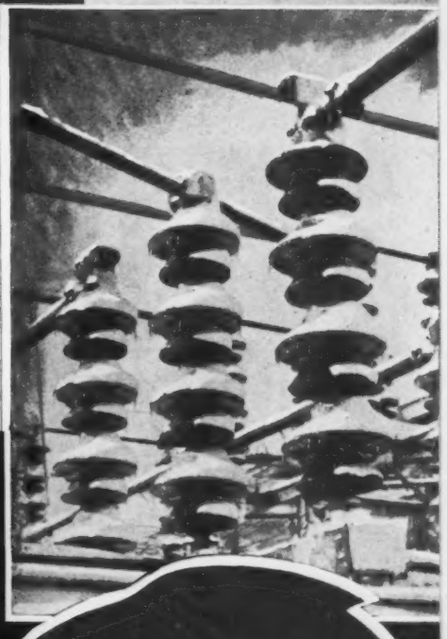
This solution to the problem has had many satisfactory results: The load was retained, the customer effected a saving, relations were im-

REMOTE SCALE HOUSE HEATED ELECTRICALLY

Although convenient for weighing materials, the new scale house and yard office of the Copperweld Steel Company, Glassport, Pa., was a considerable distance from the heating system. To extend the necessary piping would have been expensive. A 4½-kw. blower type air heater installed at the suggestion of the local power salesman provided a simple solution. With the heater a uniform temperature of 72 deg. F. is automatically maintained during the coldest weather.

R&IE HI-PRESSURE CONTACTS

at work



an everyday job with any condition

"Yes sir, its an everyday job to easily operate an R&IE Hi-Pressure Contact Switch. The powerful, rotating blade action snaps a load of ice or sleet away from the contact parts, and the operator hardly notices any difference when he opens the switch." "Now, when the open switch loads up with ice, you ought to see how the blade chips off the ice when it rotates into contact position under that Hi-Pressure".

A NEW, CLEAN CONTACT WITH EACH OPERATION.

Write today for interesting test data on Hi-Pressure Contact Switches. Do you have the latest Bulletins?

You have, no doubt, seen all types of equipment loaded down with ice. If it's R&IE, it's dependable.

RAILWAY & INDUSTRIAL ENGINEERING CO., Greensburg, Pa.

IN CANADA — EASTERN POWER DEVICES, LTD., TORONTO

proved 100 per cent and money that had been set aside for installation of a steam plant was used for modernization.

•

Study Dredging Costs Electric vs. Diesel

By W. H. PARK
Industrial Sales Engineer
Pacific Gas & Electric Company
San Francisco

Data indicative of savings to be realized by dragline operators engaged in any type of excavation are given in the accompanying tabulation which compares the operating costs of Diesel engine and electric powered draglines engaged in placer mining in the mother lode region of California. Draglines have taken a definite spot in placer mining economics where small quantities of comparatively low-grade gravel exist.

Installations consist usually of a dragline dredge located on land, and a floating washing plant. Roughly, the yardage handled varies from 50 to 250 yards per hour and the depth of deposit worked from 4 to 10 ft., sometimes up to 20 ft. Because of the semi-portable nature of this equipment many miners employed Diesel engine drive. By dint of thorough comparative cost studies, the Pacific Gas & Electric Company has convinced many operators of the advisability of using electric service. Since most operators completely replace the different units of their plants, including Diesel engines, about every two years, the field offers a continuing market for new load.

A "typical" dredging installation, that of the Atlas Gold Dredging Company operating east of Lincoln, Cal., uses an average of 50,000 kw.-hr. per month at an average load factor of 48 per cent.

Investment in Plants

	Plant A (Electric)	Plant B (Diesel)
Exclusive of power plants	$40,697	$29,250
Including power plants	44,429	43,568
Estimated salvage (after two years)	11,000	11,000

Charges on Power Units

Investment (engines or electric equipment)	$3,732	$12,418
Estimated salvage (after two years)	1,500	4,000
Monthly depreciation (over 2 years)	$93	$350
Monthly apparent operating costs	655	904
Monthly hidden labor costs due to difference in running hours	.....	212
Total monthly power costs	$749	*$1,466

* Includes pumping water with 40-hp. Diesel.

Summarized Cost Comparison

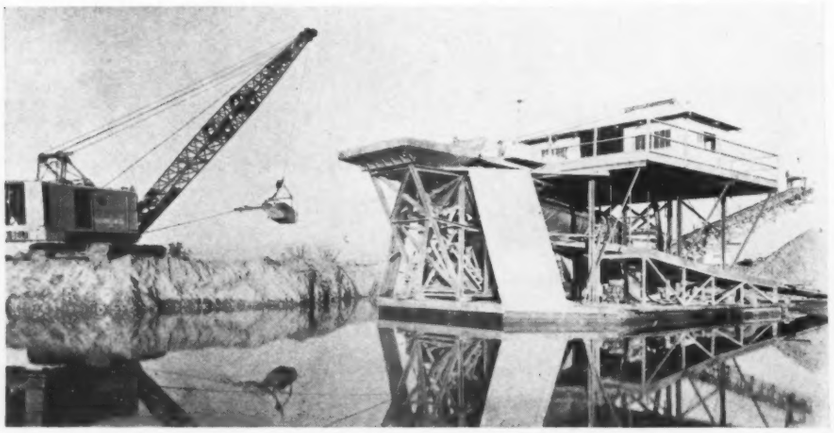
	Both plants Electric (B Estimated)		Both plants Diesel (A Estimated)	
Monthly	Plant A	Plant B	Plant A	Plant B
Operating costs of power	$ 656	$787	$1,055	$1,116
Fixed charges for power	93	105	308	350
Total power costs	$749	$892	$1,363	$1,466
Unit Costs				
Power cost per bank-yd.	1.16¢	0.67¢	2.28¢	1.18¢
Ditto per operating hour	$1.25	$1.49	$2.47	$2.66
Monthly saving (electric over Diesel)	$514	$574	....	.....
Total saving over two years	$14,700	$13,800	....	.....

The accompanying cost analysis for comparable electric and Diesel-operated dredges show typical economies to be realized by operators through use of purchased power. Because of some differences in material handled and the methods of obtaining water, the analysis includes an estimate of the cost of each of the two plants with both types of drive.

Plant A operates entirely on electric drive, using 1¾-yd. buckets on a Bucyrus Erie dragline, powered with a 50-hp. line-start motor. The washing plant employs a 50-hp. electric motor on the pump and a 30-hp. motor driving the screen and conveyor. Average daily operating time is 19½ hours.

Plant B uses 1¼-yd. buckets on the same type of dragline, powered with a 110-hp. Diesel engine. Its washing plant, also slightly smaller in capacity, employs a 45–60-hp. Diesel. Average daily operating time 18 hours.

Wherever sufficient gravel exists for an operation of a year or more electric drive is justified if cost of building and removing the distribution line is not excessive.



Uses 50,000 kw.-hr. monthly at 48 per cent load factor

Experience with this installation of the Atlas Gold Dredging Company justified the prediction that electric drive would make possible the greatest number of effective operating hours per day.

•

Strip Heaters Solve Production Problem

Processing of a new building material product called for a coated metal sheet to be uniformly heated to about 750 deg. F. to melt the coating evenly. The fuel-fired chain conveyor-type oven being used employed burners firing on a baffle beneath the sheet which travelled horizontally through the oven. Difficulty was experienced with this oven in getting the top of the sheet hot enough to melt the coating without burning up the coating on the underside. Electric heat had been tried, but on numerous occasions sheets had come in contact with the open electric heating elements, causing both the sheets and the heating elements to be severely damaged by the resulting short circuits. The customer had therefore adopted gas heating for existing ovens.

Since the temperatures required in this process were not extremely high, it was suggested by the local power salesman that strip heaters might be successfully used, eliminating the danger of short circuits due to the open elements. High-temperature, low-current density strip heaters were recommended and 20 kw. of heaters were installed.

The strip heaters were placed in the top of the oven to heat the upper side of the sheet and to provide temperature control for the oven. The fuel-fired burners were retained to supply the majority of the heat. Much better results were obtained immediately. The customer eventually replaced the burners in the bottom of the oven with an additional 20 kw. of electric strip heaters. In order to get out the product now necessary capacity of the electric heating elements in the oven has been increased to 80 kw.

Among the many refinements in design which attest to Hi-Voltage's leadership in the field of Air Break Switch manufacture is the fully enclosed mechanism which alone can assure positive, easy operation under all weather conditions. Why not investigate Hi-Voltage's "pluses" in quality that ask no *premium* in price? Send for Bulletin 26 *today*, so you'll get the complete story and have specifications always available for ready reference.

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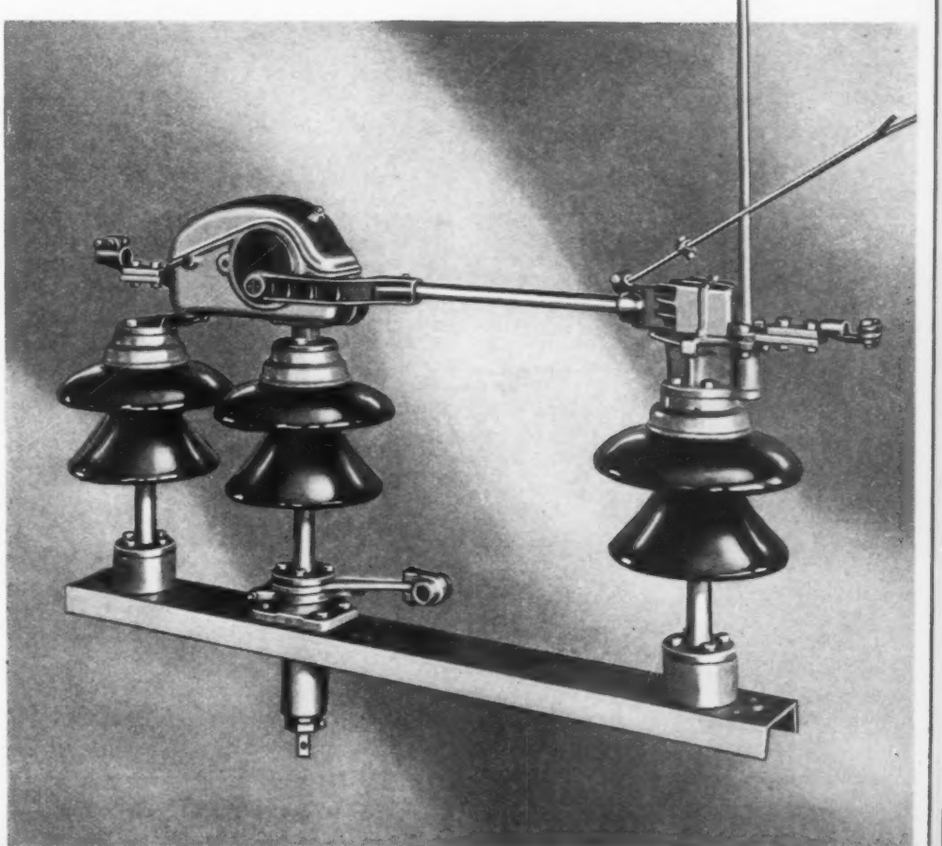


HI-VOLTAGE EQUIPMENT CO.

2891 EAST 79TH ST., CLEVELAND, OHIO

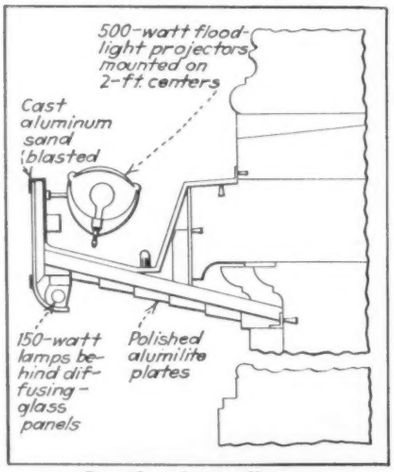
Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

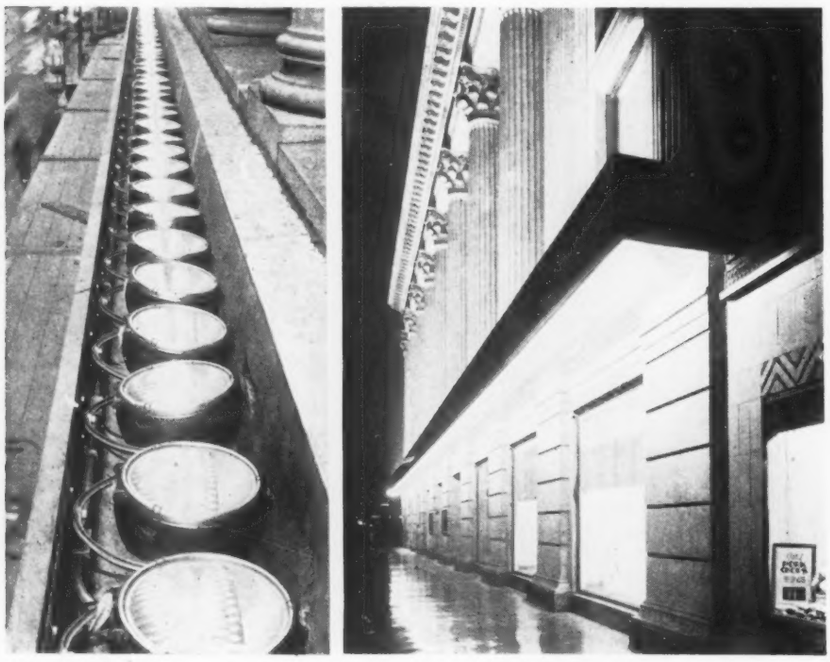
New Floodlighting for Chicago Utility

The recently completed floodlighting installation on the main office building of the Commonwealth Edison Company, Chicago, is of special interest because it is an adaptation of the latest developments in this type of outdoor lighting to the architectural character of an existing commercial building. More than 550 lamp bulbs are concealed in a cast aluminum canopy, specially constructed in harmony with the basic architectural design of the structure. A total of 134 reflectors, containing 500-watt lamps, floodlight the area above the first-floor ledge, and the area below is illuminated by 150-watt lamps through 370 diffusing-glass windows.

The four lower floors of the large office building are illuminated. A ledge above the first floor windows conceals the batteries of floodlights which throw light upward bathing the second, third and fourth floors with light, while other lights illuminate the first floor and sidewalk. The installation was designed by Commonwealth Edison Company illuminating engineers in co-operation with Shaw, Naess & Murphy, architects. In advance of the actual installation, a scale model, 7 ft. wide and 4 ft. high, of the lower portion of the building was constructed in the company's lighting laboratories to permit tests of different floodlighting plans and various lighting intensities.


500-watt floodlight projectors mounted on 2-ft. centers
Cast aluminum sand blasted
150-watt lamps behind diffusing-glass panels
Polished alumilite plates

Details of installation



More than 100 kw. are used to get this effect on the floors of the building

Range Acceptance High in Washington

The electric range will be found to play an important part in the large sales volume for 1937, soon to be reported by the Electrical Institute of Washington, D. C.

Particular attention has been paid by the institute toward arranging for the sale of electric ranges in the new homes erected in large numbers in the District of Columbia during 1937. To achieve this goal on the scale reached during 1937 requires three basic factors, according to Director John S. Bartlett: First, the dealer sales force must be trained for electric range selling; second, the salesman must be able to make sufficient compensation from the sale of ranges; third, some way must be found to take care of the extra wiring and installation costs.

As is the case in the average utility operation, the increasing sale of

ranges and other appliances in Washington provides for the usage of more kilowatt-hours and therefore paves the way for rate reductions to all customers.

Upon this basis the Electric Institute has been able to gain numerous helps from the personnel of the utility company serving the district. This is shown by the way wiring and financing arrangements are handled.

The dealer who sells an electric range selects a contractor to make the consumer's installation. Fifteen dollars has been added to the price of the range to take care of this installation, which runs from the meter to the range.

•

Range Popular Due to Company Selling

Steady, concentrated stimulation and selling by Potomac Edison Company are the two factors basically responsible for its consistent record of electric range sales and its present high range saturation of approximately 14 per cent. Normal characteristics of Potomac Edison territory have dictated the load-building policies followed by the company with striking success.

There is the usual pressing need for net revenue to combat increased taxes and increased operating expenses and the range and water heater have been among the remedies employed to meet this pressing need.

With about 59,000 domestic customers scattered over 6,300 square miles of territory located in four states and predominantly rural in character, the company could take the benefits of electric service to its customers only by directly assuming the sales burden.

Year-round campaigns are engaged in to provide constant stimulation to salespeople and special meetings with consumers are planned for spring and fall. Home economists and home-lighting advisers are organized for full co-operation with company salesmen.

Salesmen work on commission basis and are augmented by "free installation" on electric range sales. Such costs, consisting as they do of fixed additions to plant, are capitalized. The relatively few active dealers in the territory engaged in electric range sales are extended the same installation advantages that are made available to company salesmen.

Questions raised by officers of combination companies as to the relative merits of gas and electric range loads are not of importance in Potomac Edison as it is felt that range diversity increases as saturation increases. For example, a meal is cooked at a different hour in the town compared to the country, the big meal of the day occurs at different hours and cooking may begin at many various hours, depending upon the cooking speed selected by the individual home manager.

•

Employee Campaigns Boost Electric Load

Exceptional gains in load building have been made by Public Service (N. J.) Electric & Gas Company during the past year. Appliance sales have reached record totals, due in part to the help of all employees in turning in sales leads. During October electric appliance sales were 10.7 per cent above the corresponding period one year ago and the highest for any month in the company's history.

In recent fall campaigns centered upon lighting and in which employees participated, 907,776 electric bulbs were sold and 39,641 lamps, more lamp sales than in any other month in company history.

Electric refrigeration usage has reached a saturation of about 33 per cent among the 300,000 residential customers of Public Service, whereas as recently as 1932 the saturation was only 14 per cent.

Enhanced interest on the part of residential customers has been created by the "House Practical," which was remodeled and opened September 15, 1937. In the first three months it has been open attendance has averaged 7,400 visitors per month.

THE OLD CORNER DRUG STORE AS SOURCE OF MORE LIGHTING LOAD

Tolers of Compton, Calif., lit up its store this summer with an installation, which has proved its excellence as a means of making it easy for the customer to buy. The idea of better lighting, pushed vigorously by the Los Angeles Bureau of Power and Light, paved the way for Luminous Structures, Inc., Los Angeles, to perfect and sell the installation. Simplicity and economy were achieved by concentrating the light sources in a trough running around the room. This lights the store, concentrates light on the shelves and serves as a brilliant, silhouette sign, designating the various departments of the drugstore.

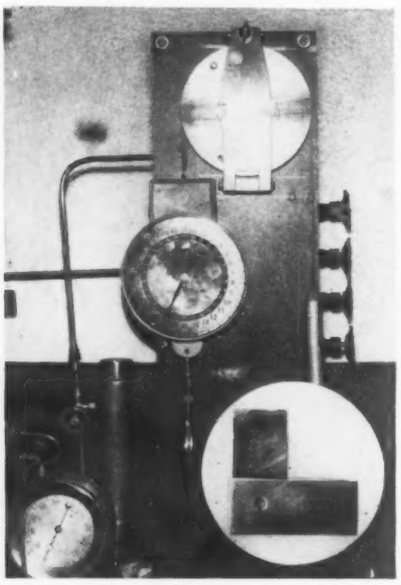
New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Torsion Test Shows Best Weld Condition

By D. K. CRAMPTON and J. J. VREELAND
Chase Brass & Copper Company, Waterbury, Conn.

Results of strength tests on spot welds in the more common copper-base alloys conducted by Chase Brass & Copper Company indicate that a torsion test is an improvement over the simple ripping test commonly used. This type of test, sample results of which are given in the accompanying table, seems capable of differentiating between degrees of perfection of welds, while the standard ripping test gives merely a quantitative indication of the presence or absence of a weld.



Torsion test machine reveals effect of varying conditions on spot welds in copper base alloys.
Insert shows test specimen.

The torsion tests conducted were confined to one thickness of metal; namely, 0.036 in. Specimens were surface treated by buffing with greaseless rouge. Welds were made in a 150-kva. spot welder with balanced air-operated head and electron tube timing control using copper-chromium alloy electrode tips with 3/16 in. diameter contact surface.

Specimens were welded together at a single point with their axes at 90 deg. to each other. The testing machine, shown in the accompanying illustration, was designed so that the two portions of the welded specimen fit into machined grooves, one in a stationary plate and the other in a plate capable of rotation on a center coaxial with the center of the weld spot to be tested. By means of a cord at the periphery of the rotating disk, and a spring balance, the maximum torque sustained by the weld could be measured.

It is believed that the torsion test will be found an excellent one for examining the effect of sizes or shapes of welding tip, varying thickness of metal or different surface finishes. The observed data* lead to three general conclusions that apparently apply to all alloys within the range of conditions here examined: (1) Torque increases markedly with increasing energy input. (2) Torque increases appreciably with increase in number of cycles per spot. (3) Torque decreases somewhat with increased electrode pressure.

* See paper by authors, page 13, Supplement to Journal of American Welding Society, October, 1937.

Silicon Bronze

Copper 96.0% Silicon 3.0% Zinc 1.0%

Cycles	Electrode Pressure, Lb.	Heat No.	App. Kva. Input	Total Spot Thickness-In.	Torque Lb.-In.
2	400	7	50	0.066	58
		9	65	0.063	70
		11	80	0.060	90
		13	100	0.050	*91
4	400	6	45	0.068	66
		8	60	0.064	82
		10	70	0.058	*101
		12	90	0.052	*115
6	400	4	30	0.072	33
		6	45	0.065	71
		8	60	0.062	101
		10	70	0.049	*99
8	400	4	30	0.071	48
		6	45	0.064	70
		8	60	0.057	95
		10	70	0.050	113
4	510	6	45	0.070	58
		8	60	0.064	73
		10	70	0.061	96
		12	90	0.053	*111
6	510	4	30	0.071	31
		6	45	0.069	66
		8	60	0.063	89
		10	70	0.055	106
8	510	5	35	0.070	56
		7	50	0.067	83
		9	65	0.056	99
		11	80	0.053	112
4	625	5	35	0.070	20
		7	50	0.069	70
		9	65	0.065	84
		11	80	0.051	*103
6	625	6	45	0.071	70
		8	60	0.066	74
		10	70	0.063	98
		12	90	0.052	*111
8	625	5	35	0.070	28
		7	50	0.065	75
		9	65	0.060	99
		11	80	0.050	*111

* On these tests the samples failed by shear at the edge of the weld area rather than by torsion in the weld.

It might be concluded that best results would in general be obtained by using a high energy input, large number of cycles per second, low electrode pressure. There are, however, distinct limitations to such a course. It might lead to one of the following difficulties: (a) Sticking of electrodes, resulting in burning or "picking up" of electrode points; (b) tendency for electrodes to penetrate too deeply into work; (c)

AS IN MANY OTHER METROPOLITAN AREAS

HOUSTON

MURRAY CURRENT LIMITING REACTORS PROTECT DISTRIBUTION SYSTEMS

Indoor Dry Type Feeder Reactors Rated 188 K.V.A., 628 Amperes, 23 K.V., 60 Cycles

The large number of Murray Reactors in service have proven without question, their efficiency and reliability during the severest short circuit disturbances.

Murray Current Limiting Reactors afford protection towards continuity of service, reduce stresses on plant equipment and isolate the disturbances to the affected area next or near the short circuit. They are supplied for all kinds of services—indoor or outdoor—for operating voltages up to 33 K.V. and current ratings up to 5,000 amperes.

Send us your specifications when in the market for short circuit protection. Efficiencies guaranteed.

METROPOLITAN DEVICE CORP.

BROOKLYN N. Y.

spitting or flashing of metal between contact surfaces in high zinc-bearing alloys.

•

Erratic Grounds Traced to Rectifier

Erratic operation of ground leakage protective relays is shown by A. G. Bullen, Liverpool, in *Electrical Review*, to be susceptible of explanation by a new theory based on laboratory tests correlated with field experience. Due to the presence of filtered water in deep soils, alternating currents through new "grounds" encounter considerable initial resistance, and after installation of a "ground" for some time very small leakage currents may cause chemical breakdown in the soil, producing compounds in the soil and at the electrodes in the newly formed "electrolyte," which may greatly aggravate this initial high-resistance condition.

Either a chemical coating over parts or all of an electrode converts its contact surface into a half-wave rectifier, a condition which is immediately accelerated, once it starts, with a consequent considerable increase in alternating-current resistance, or else the electrode is isolated entirely by the insulating characteristics of the chemical shield.

Thus the non-operation of protective ground trips after a prolonged period of installation may be explained upon this theory. It is a well-known fact that many relays fail to operate, but upon examination appear to be in proper adjustment.

The remedy, as suggested by Mr. Bullen, is to use the well-drained surface soil as a contact rather than the wet subsoil "electrolyte." Such a procedure will decrease the chemical activity at the electrode. Mr. Bullen suggests grounding to the transformer bedplate or the neutral at the consumer's site.

•

New Oil Conservator for Bushing Failure

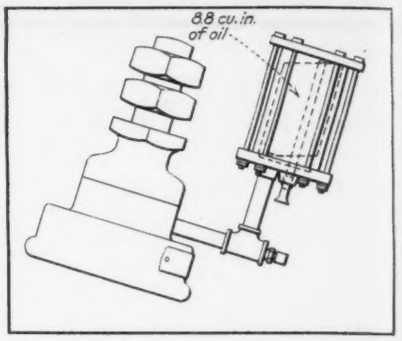
By ROBERT M. EMBLIDGE

Superintendent of Operation Buffalo Niagara Electric Corporation, Buffalo, N. Y.

An oil conservator for oil switch and transformer bushings developed in the Buffalo Niagara Electric Company was completed a long experimental period and were recommended for service.

The conservator keeps the bushing filled at all times with oil and has successfully kept moisture out. It also serves for a telltale as to gasket condition. It is generally connected to the bushing at the filling plug hole.

There are at present 1,200 of these conservators in service on the Niagara Hudson System, with an average of four years each since installation. There have not been any failures with bushings equipped with conservators. It has not been necessary to remove any of these bushings on account of high power factor.



New oil conservator keeps bushing filled with oil

The device is a small oil cup with amber glass, a filling plug with Alemite fitting, a pipe for breathing and a sump, a plug which when removed from the sump will allow any moisture to be drawn off before it enters the bushing proper.

All metal parts on the top of the bushing are painted with glyptal lacquer (G. E. No. 1201), especial care being used to fill all joints and cover edges of gaskets.

Patent has been applied for.

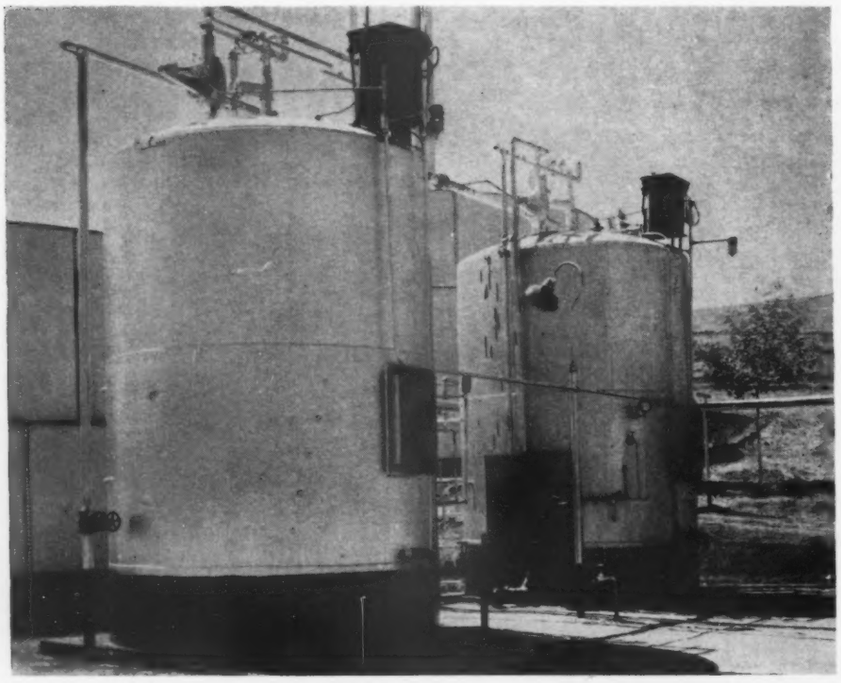
•

Dehydrate Oil With High Potential

Applying a recent development of the Petroleum Rectifying Co. of California, the Union Oil Company is dehydrating crude oil at its Poso Creek plant in California by subjecting the emulsion to a high-potential field. This produces agglomeration through ionization of water particles and their envelopes and permits treating 2,000 bbl. of emulsion with but 40 kw.-hr. of energy, or 0.02 kw.-hr. per barrel of oil.

The process consists essentially of two steps: First, the rupture of the water particles by application of a potential of from 5,000 to 10,000 volts per inch; second, the agglomeration of the freed water particles into sizable droplets which settle by gravity. The field is applied in one tank, and settling takes place in a second, dry oil being removed from the top.

The electrical circuit consists of a simple control board, a resistance coil and a special step-up transformer. The last is designed to withstand heavy surges and in large treaters, which handle up to 3,000 bbl. of oil per day, is rated 115 and 230 volts to 16,500 volts, 5 kva.



Voltage of 5 to 10 kv. per inch applied to crude oil ruptures water particles which settle out by gravity, dehydrating the oil

EXTRA CHARGE FOR THIS FEATURE • IT'S STANDARD ON ALLIS-CHALMERS POWER TRANSFORMERS

THE UNI-DIRECTIONAL BREATHER MAINTAINS THE DIELECTRIC STRENGTH OF YOUR TRANSFORMER OIL DURING YEARS OF SERVICE

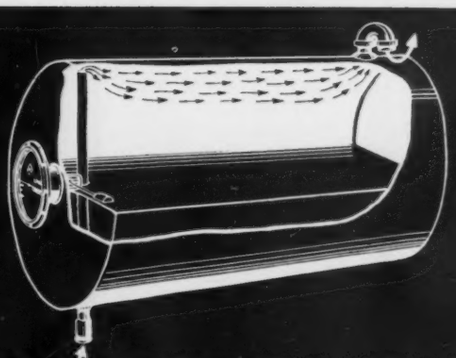
● You don't have to worry any more about moisture accumulation due to breathing in power transformers with its resultant danger of costly interruption. Whether provided with an expansion tank, inert-gas protection, or without either, Allis-Chalmers Power Transformers come standardly equipped with a Uni-directional Breather that maintains the dielectric strength of your transformer oil during years of service • Experienced engineers can appreciate this outstanding feature, for the Uni-directional Breather, made differently from any other breather in the world, gives protection to your transformer and reduces the number of times filtering is necessary • Perfect ventilation, providing a continuous flow of warm air in the gas space over the oil, carries off all accumulation of moisture and eliminates the possibility of condensation and rust formation which is a constant hazard with ordinary breathers • The Uni-directional Breather has been thoroughly proved by exhaustive laboratory and field tests and has been a part of transmission systems throughout the country for years • Other exclusive Allis-Chalmers features are: Unusual Core and Coil Assemblies, Oil-Sealed Inert-Gas System, No-Load Tap Changer, Oil-Tite Construction, Combined Expansion Tank and Relief Device, and Tap Changing Under Load with unusual conveniences • Make your dollar go farther — specify Allis-Chalmers Power Transformers.

854

TRANSFORMER DIVISION

ALLIS-CHALMERS

MILWAUKEE·WISCONSIN



PERFECT VENTILATION IS THE SECRET

● The Uni-directional Breather is a pipe which extends up through the oil and is heated by the oil in the transformer or expansion tank. This sets up a circulation, drawing air from the outside up through the pipe, across the gas space above the oil, and out through the weatherproof breather on the top. This circulation of air, due to the slight thermal heads available, prevents condensation and carries off the accumulated moisture.

We make a
complete line of
ELECTRICAL
CONDUCTORS
for every Industrial
and Domestic purpose!
NEW U. S. ROYAL CORD WIRE BOOK
Shows why U. S. Royal Cord returns $1.57 of Performance compared to $1.00 of Performance from average cord. Contains 20 comparative tests (illustrated); specifications; installation data, and other features!
Tune in on C.B.S. Wednesday Evenings for the U. S. Royal Master Tire Program with Ben Bernie and an all star cast. 9:30 E.S.T., 8:30 C.S.T., 7:30 M.S.T., 6:30 P.S.T.
MANUFACTURERS OF ELECTRICAL

...ire

IS ONLY AS GOOD AS ITS

INSULATION

UNITED STATES RUBBER COMPANY
US
TRADE MARK

United States Rubber Company

United States Rubber Products, Inc., New York, N. Y.

...L **WIRES and CABLES**

LINEMEN'S BLANKETS · SPLICING COMPOUND
TAPE · SWITCHBOARD MATTING

Manufacturing AND MARKETS

Shipment Drop Shown in Washing Machines

Washing machine shipments in December showed the sharpest decline of any month in 1937, amounting to only 55,843, as against 93,532 in the same 1936 month, a decline of 40.2 per cent.

Shipments for the year ended December 31 totaled 1,642,019, as against 1,729,135 in 1936, a drop of 5.04 per cent.

Ironer shipments in December totaled 9,180, as against 14,777 in the same 1936 month, a decline of 37.9 per cent. Total shipments for the year amounted to 178,858, as against 180,281 in 1936, according to the American Washing Machine Manufacturers' Association.

It was reported that there was a marked advance in the purchase of washers retailing in the upper price levels of $70 and over. Washers in the upper bracket amounted to 42.6 per cent of the total, as against 31.9 per cent in 1936.

•

Allis-Chalmers Appoints Two Assistant Managers

Allis-Chalmers Manufacturing Company's publicity department for power, electrical and industrial machinery now has two sections, effective as of January 15. George J. Callos has been appointed assistant manager in charge of sales promotion embracing advertising, bulletins, exhibitions, house organs, etc. A. K. Birch has been appointed assistant manager in charge of market analysis, sales organization service embracing price books, data and sales information, and the distribution of literature.

•

Will Vote to Rescind Plan

Stockholders of Knapp-Monarch Company will vote at a special meeting called for February 19 on a proposal to rescind the financing plans ratified last October and to authorize new financing plans calling for issuance of 24,351 shares of common stock at $11 a share.

Stockholders of record February 23 would be given the right to subscribe at that price for one share for each five shares held. Stockholders also will be asked to authorize reservation of 7,500 shares of common for subscription by officers at prices to be fixed by the board, but at not less than $11 per share.

•

Norge Distributors Change Name; Increase Personnel

Announcement has been made that Moser & Suor, Inc., Kansas City, Mo., has changed its name to Moser-Keller, Inc., following the retirement of J. G. Suor, one of the founders and former president. Moser-Keller, Inc., is distributor for the entire state of Kansas and for the western half of Missouri for Norge electric and gas home appliances manufactured by the Norge division of Borg-Warner Corporation, Detroit.

Dan Moser, vice-president of Moser & Suor since its organization in 1930, is the new president of Moser-Keller, Inc. Don Keller, who was connected with Moser & Suor since last May, has been elected vice-president and general manager of Moser-Keller and Tom Condon is the newly appointed general sales manager.

•

York Ice Delays Offering

York Ice Machinery Corporation has filed an amendment with the SEC delaying offering date of proposed security issue to February 23.

•

Manufacturers' Exhibit

Under the auspices of the Electrical Manufacturers Representatives Association of Michigan an electrical manufacturers' exhibition will be held in the Masonic Temple, Detroit, February 16-18. One hundred booths have already been taken, which will be devoted exclusively to wiring materials and electrical equipment for buildings and industrial plants.

Lead Shipments Show 82% Gain Over 1936

Domestic shipments of lead to manufacturers for cable covering during 1937 amounted to 85,597 tons, as against 46,977 tons during 1936, a gain of 82 per cent, according to the American Bureau of Metal Statistics. Domestic shipments for all purposes during the year were 575,933 tons, against 513,361 in 1936, an increase of some 12 per cent.

Use of lead runs ahead of shipments, of course; during 1936 use of lead for cable covering totaled 61,400 tons. Assuming a similar increase for 1937, that year would be the highest year since 1931 and perhaps since 1930, since this use of lead accounted for 117,000 tons during 1931. However, 1937 will run behind the peak year of 1929, during which year some 220,000 tons of lead was used for cable covering.

Stocks of refined lead increased 15,558 tons during December, 1937, to total 129,131 at the beginning of 1938, against stocks of 171,856 tons in 1937 and 222,306 in 1936.

•

Gets Australian Contract

City Council of Mildura, Victoria, Australia, has secured permission from the Victorian State Electricity Commission, Melbourne, to award a contract to Babcock & Wilcox, Ltd., Melbourne, for installation of boiler units and auxiliary equipment at municipal power station, designed to use briquettes as fuel. The award will be made at $184,250, the figure tendered by the company, and will include an integral economizer unit. Contract covers complete erection and placing in operation.

•

New York Branch Wins Cup

The President's Cup, awarded annually by Col. Robert H. Morse, president of Fairbanks, Morse & Company, to the company's branch office with the best sales record, was presented January 21 to the New York branch. The

Specify BERMICO DURA-CELL CONDUIT

for better cable protection

CABLES are "all set" for long service life when pulled into Bermico Dura-Cell ducts. For Bermico's rugged wall structure and water-tight joints effectually guard cables from the destructive action of acids, alkalis, moisture, corrosion and electrolysis.

Tough, virgin wood fibre, specially processed for conduit use, builds into Bermico Dura-Cell the extra strength and toughness . . . the high resistance to shocks and impacts . . . the added permanence that assures cables longer and better protection.

And Bermico Dura-Cell's lighter weight assures savings in trucking and handling costs . . . permits rapid, economical installation. A non-split coupling (available in 3" to 5" sizes) eliminates the expense and loss of time involved in replacing broken couplings.

Send for Bermico Fibre Products catalog. Brown Company, 420 Lexington Ave., N.Y.C.

WHY THIS NEW COUPLING CAN'T SPLIT

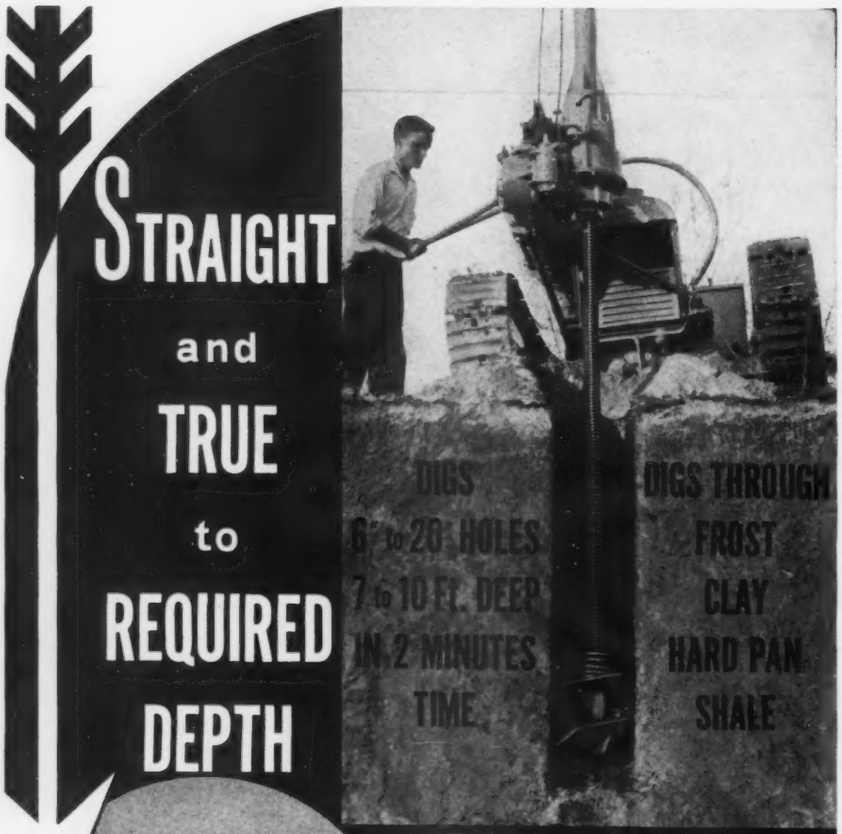
Driving forces tapered conduit ends solidly against fillet in center of coupling. Pressure is held on direct line through fillet. Ends cannot wedge and press outward to split the coupling.

EXCLUSIVE DISTRIBUTORS
WESTINGHOUSE ELECTRIC SUPPLY COMPANY
BRANCHES IN EVERY LARGE CITY

BROWN COMPANY

FOREMOST PRODUCERS OF PURIFIED CELLULOSES FOR QUALITY PRODUCTS

VIRGIN WOOD FIBRE GIVES GREATER STRENGTH TO **BERMICO DURA-CELL**



DIG through frozen ground and save money while the job is in progress. Lighten the amount of manual labor and add a high degree of safety. Bore at difficult angles and hard to reach places. This all adds up to the advantage of Central Stations for cold weather maintenance or line construction work. There are many types and sizes available—mounted on truck or tractor. Write for descriptive literature.

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

victory dinner, held in the Belmont Plaza, was the second at which T. W. Drennen, New York manager, had received the cup, for his branch won the sales contest also in 1934.

•

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following assignments to their sales staffs:

Triangle Conduit & Cable Company has announced that the territory of New York State north of Poughkeepsie and including also the cities of Sayre, Erie, Warren and Bradford in Pennsylvania is now under the supervision of J. J. Slater, district manager in Boston, Mass. R. Savage has been added to Mr. Slater's sales organization and will devote the principal part of his time to covering this additional territory.

Penn Electric Switch Company has opened a branch office in Philadelphia. D. A. Coon, formerly sales engineer on the company's New York branch staff, has been placed in charge of the new Philadelphia branch.

W. T. Darcy has been placed in charge of renewal parts sales for industrial apparatus, serving as assistant to the manager of the control and renewal parts division of General Electric's industrial department. He succeeds L. R. Wood, retired.

Terry Steam Turbine Company announces the appointment of R. E. Chase & Company, Tacoma, Wash., with branch offices in Seattle, Portland and Spokane, as a representative of the company.

Durakool, Inc., Elkhart, Ind., has announced the appointment of Clarence R. Hunt, San Francisco and Los Angeles, as its representative in California and Gillette & McLaren, Portland and Seattle, as its representative in the Northwest.

•

Hygrade Gets Contract

Hygrade Sylvania Corporation has been awarded a contract to supply the city of New York with $50,000 worth of multiple incandescent lamps for use in municipal properties. In addition, the company was recently awarded subcontracts at a value in excess of $60,000 for New York City lighting.

•

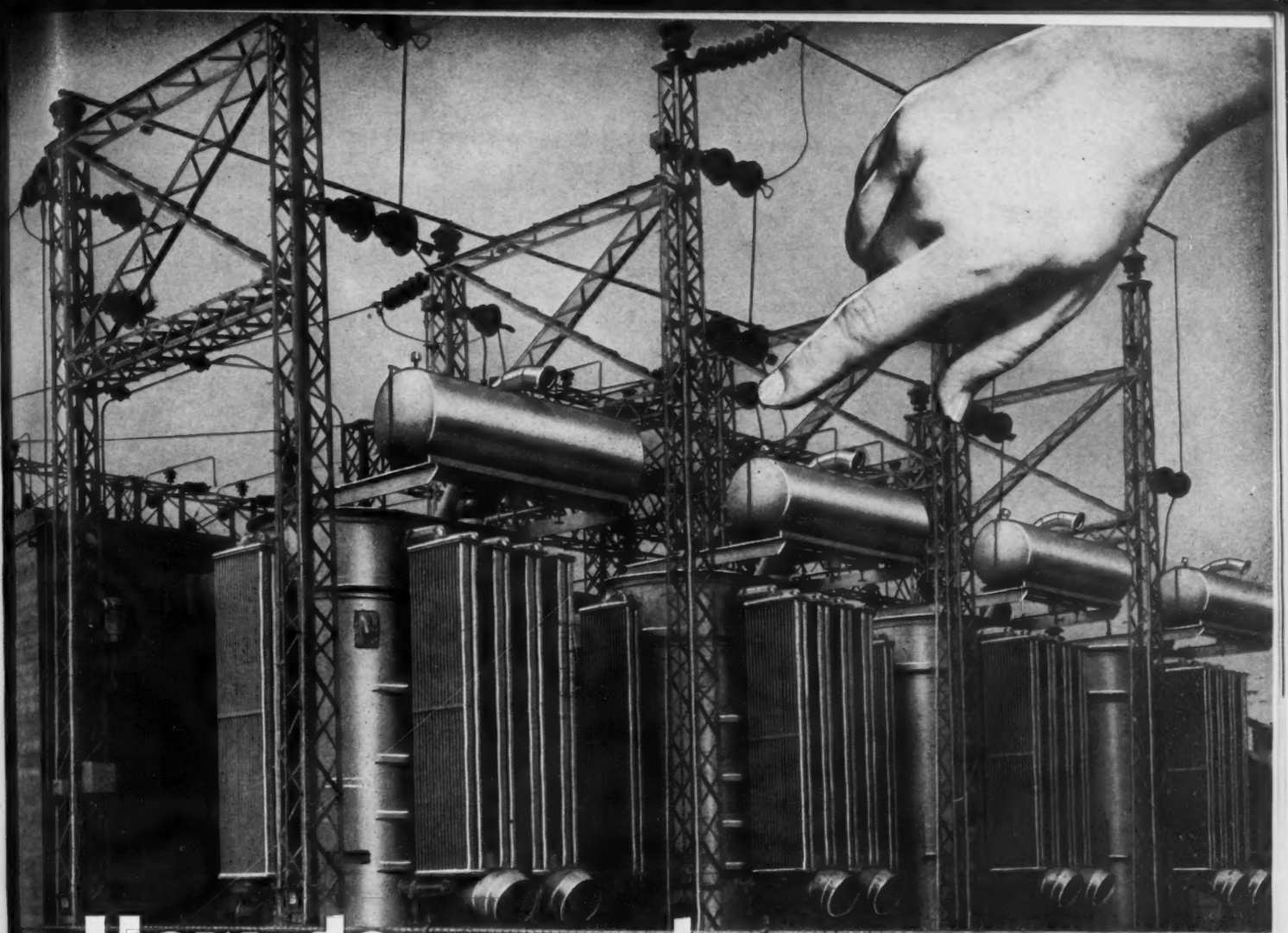
Accumulations Dividend

Canada Wire & Cable Company has declared a dividend of $10 a share against accumulations on the preferred stock, together with the regular quarterly distribution of $1.62½ on the issue.

New York Metal Prices

	Feb. 2, 1938 Cents per Pound	Feb. 8, 1938 Cents per Pound
Copper electrolytic	10.00*	10.00*
Lead Am. S. & R. price	4.90	4.90
Antimony	13.75	13.75
Nickel ingot	35.00	35.00
Zinc spot	5.35	5.35
Tin Straits	40.875	40.50
Aluminum, 99 per cent.	20.00	20.00

* Delivered Connecticut Valley.



How do you choose your Transformers?

IS IT a matter of the transformer's performance . . . dependability . . . economy . . . or is it the integrity and reputation of the maker?

Naturally, it is a combination of all of these. But, what about it? Aren't transformers all designed and built in accordance with the same basic principles . . . don't they even look very much alike?

True, the same basic principles apply, and transformers, in general, are quite similar in appearance. But, *how* are those basic principles applied? Are they applied with the idea in mind to just "get by", or are they applied in a liberal manner to provide extra safety and extra dependability?

And after the transformer is designed, are the annealing, the impregnating, the vacuum drying and other extremely important steps carried out fully despite heavy production schedules?

To what types of employees is the work of manufacturing entrusted . . . are they high types of *men* who take pride in the quality of their work?

After the transformer is installed on the job and paid for, does the manufacturer lose interest? In event problems arise, is it difficult to get his immediate attention, or is the manufacturer eager to cooperate and help solve these problems?

Since 1896 . . . when the commercial use of transformers had its beginning . . . Moloney Electric has been growing steadily. This growth has resulted from being able to honestly answer all of the foregoing questions most favorably.

Liberal design, carried out by the highest types of workmen using the best materials obtainable, results in the finest of transformers . . . Moloneys!

MOLONEY ELECTRIC
SAINT LOUIS
TRANSFORMERS

Reliable

CONCENTRIC CABLE CLAMPS

Install Service Cable more conveniently.

●

Save a length of cable on each installation.

●

Reliable Concentric Cable Clamps are high in strength, neat and non-corrosive. They do not injure the cable and they are reasonably priced.

Reliable ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO ILLINOIS

Field Reports on Business

Further declines were noted in most lines during the week. Industrial production is slower, although an upturn is looked for in the spring. Utilities faced with lower power sales are slow in starting construction work. Uncertainty over Administration policies continues to predominate.

PACIFIC COAST

In general, January business was poorer than December's, because while staple and industrial lines showed an increase, there were no holiday appliance sales as in December. Furthermore, the early month gains were lost in the later stagnation caused by Administration tinkering with business and the consequent slump in the stock and raw material markets. However, such factors as the new FHA, an increase in lumber sales and a San Francisco building increase, largely composed of frame construction, of 20 per cent for this January over last, show that business is biding its time for a favorable atmosphere, and an unusually large number of specific selling campaigns are reported. The Grand Coulee Dam and power plant contract of $34,442,240 for 1,460 days work has been awarded.

Specific orders of various kinds include ranges and water heaters for the initial workers' camp and headquarters at Redding for the Central Valley project, $50,000 of power cable for the Pacific Gas & Electric Company's East Bay plants, the annual Los Angeles contract for small power transformers, orders aggregating $450,000 for 2,500,000 lb. of various wires and accessories for the Kendrick project in Wyoming, a new transmitter station for the Columbia Broadcasting system in Los Angeles and 350,000 ft. of lead and paper cable for Los Angeles including 30,000 ft. of 500,000 to 1,000,000 circ.mil sizes. Prices in copper wire and steel conduits have dropped to correspond with factory decreases, but in general the price structure is fairly firm.

NEW ENGLAND

Inquiries were more active during the past week in this district and were concerned, for the most part, with small motors and fractionals. Central and western Massachusetts machine manufacturers are reported busy filling urgent foreign orders and some small rush deliveries have been booked recently involving several lots of 5-hp. motors. A short time ago several high-speed centrifuges equipped with 7½-hp. motors were sold at a cost of about $2,500; a manufacturer of special electric therapy machines reports an unusually heavy demand and records more than 150 units equipped with ¼-hp. motors and controls sold during the past year. About 50 hp. in small motors will be used in Massachusetts state institution contracts now being bid.

Electric furnaces are receiving attention. Merchandising is spotty; reports of the Hartford Electric Light Company for 1937 list 1,295 electric range sales, 409 water heaters and 6,834 electric refrigerators.

A survey to ascertain means for forestalling the migration of industrial plants from New England will be undertaken shortly. A committee has been appointed which will make modernization studies of more than 2,500 plants in New England for the purpose of enabling manufacturers to increase production and lower costs of operation so that local companies may compete favorably with other sections.

Remodeling of 50 passenger cars with new lighting and air-conditioning equipment at a cost of $700,000 is proposed by the New Haven Road.

NEW YORK

Electrical manufacturers report that new business is only a dribble of what it was a year ago. The lack of business is attributed largely to the uncertainty of the government utility, as well as general business, program.

The bright spot in the economic picture, observers point out, is the attitude expressed by the conference of "little" business men last week in Washington. An analysis of the recommendations shows that what the "little" business man wants, and his expressed feelings, ring true of what "big" business has expressed. The slack in business is becoming more definite as business marks time waiting for the Administration to offer, in concrete terms, its plans for the future. The feeling is strong that federal spending on non-productive, and competing, enterprises is not the solution to the present situation.

Electric utilities are feeling the drop in power consumption. Budgets for expansion programs are being put into effect more slowly than had been anticipated. Some curtailment on a large scale has been noted. The revised budgets are being made to meet the present recession in business, although original figures have not been discarded definitely. Utility officials declare that little expansion can be carried out until the industry knows how far the government is going to compete with private power companies.

CHICAGO

Following the trend of the previous week, business again moved slightly downward. In practically every line activity was a little more dull. Industrial production was slower; electrical energy output dropped to a level 4 per cent below last year's figure. Production in the steel mills was curtailed a few points. Retail and wholesale trade declined moderately below the level of the previous week and approximately 10 per cent less than a year ago.

Despite the apparent blackness of the current situation, there is an undercurrent of optimism to be found. Electrical manufacturers are in good shape and many of them report that they find inventories not excessive, with replacement requirements rapidly increasing. In addition, there is a substantial volume of business which has been temporarily held up, but has not been entirely discarded, and it is anticipated that most of it will eventually come through.

Central station purchases are slow. Electrical contractors report a sharp increase in the number of additional outlets installed as a result of a local advertising campaign. Motor and control equipment sales are moderately good. Heavy machinery, of course, is still far below last year's figures. Wire and cable and fittings are currently averaging about 20 per cent below a year ago. Inquiries regarding air conditioning have shown an increase during the past two weeks.

WANTED...*a better way*

TO FIND THE NEEDLE

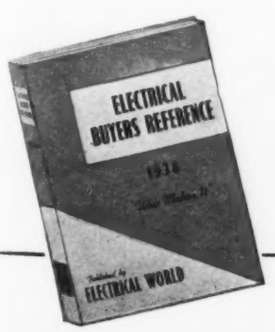
IN A HAYSTACK . . . . .

Mr. Fibbersly wants to know the name of an electrical gadget put out by Wapdoodle, Inc. — or was it Doowapple? He has lost time and temper, and he is about to lose his secretary . . . . . she will quit to go with a company who has an

ELECTRICAL BUYERS REFERENCE

Headquarters for Everything Electrical

The Buyers Reference gives names of companies, products and trade names, with a cross index to make it easy to find what you're looking for. Keep your copy at your elbow. It will answer many of your questions quickly and accurately, saving time and money in buying.



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News ABOUT PEOPLE

Walter H. Sammis Elected to New Executive Position

At a meeting held last week W. H. Sammis was elected a vice-president and a director of the Commonwealth & Southern Corporation, succeeding the late T. A. Kenney. Mr. Sammis is also president of the Pennsylvania Power Company and a vice-president and director of Consumers Power Company, both of which are operating units of Commonwealth & Southern.

Mr. Sammis became a member of Consumers Power Company in Michigan in June, 1920. Six months later he was made assistant electrical engineer and subsequently became power sales engineer. In 1924 he joined C. H. Tenney & Company of Boston for power sales and rate analysis work on the properties of that company located in New York and New England. A

Blank & Stoller

year later he rejoined Consumers Power Company as assistant to the general manager and in 1929 became assistant to the president. Three years later he was made a vice-president and director of the company and was elected president of Pennsylvania Power Company in 1936.

A native of Hempstead, L. I., and a graduate of Columbia University, Mr. Sammis spent several years in the Navy and one term as instructor in electrical engineering at Columbia University before joining Consumers Power Company in 1920.

•

E. H. Gurney Elected Head of Ventilating Engineers

Edward H. Gurney of Toronto, engineer and industrialist, was elected president of the American Society of Heating and Ventilating Engineers at the recent annual meeting in New York. He is the first Canadian in the history of the society to hold that office. Mr. Gurney is president of the Gurney Foundry Company, Ltd., and subsidiary companies of Toronto, one of the largest organizations in the Dominion engaged in the manufacture of heating and air-conditioning equipment. He has been active in the society for many years, being a member of its governing council for the past six years.

Other officers elected were: J. F. McIntire, United States Radiator Corporation, and Prof. F. E. Giesecke, Texas Agricultural and Mechanical College, vice-presidents; A. J. Offner, consulting engineer, New York, treasurer (re-elected). W. L. Fleisher, consulting engineer of New York, was elected chairman of the committee on research.

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▶ Sir John Snell, former chairman Electricity Commission, has been awarded the Faraday Medal by the council of the British Institution of Electrical Engineers. The medal is awarded by the council once a year for notable scientific or industrial achievement or for conspicuous service rendered to the advancement of electrical science.

▶ Robert W. Beck has been appointed electrical engineer for the Bonneville Dam project. Mr. Beck was formerly in Portland, Ore., where he had charge of the valuation studies for the state's PWA power network. Before his Nebraska connection Mr. Beck was engineer for City Light in Seattle.

William H. Cole to Retire from Boston Edison

William H. Cole, for 25 years superintendent of the street engineering department, Boston Edison Company, will retire from active service on March 1. Mr. Cole's early career

was identified with the transit industry in northern Massachusetts, the General Electric Company at Lynn, Mass., and he was superintendent of the electrical department of the Waltham Gas Light Company when it was acquired by Boston Edison in 1909.

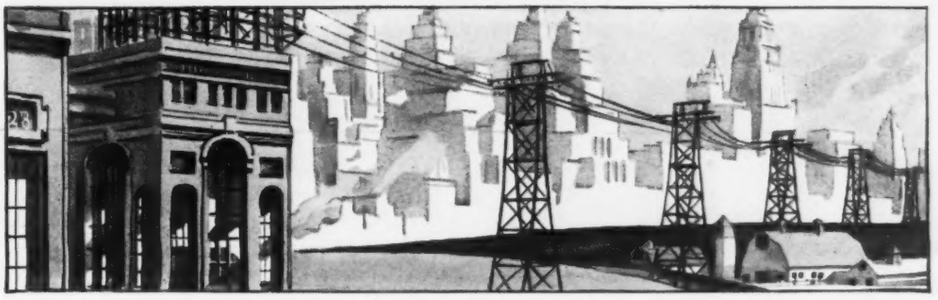
An acknowledged authority on cable work, he served for many years on the cable committee and as chairman of the N.E.L.A. underground systems committee. He has also served as chairman of the high-tension cable committee of the Association of Edison Illuminating Companies.

•

▶ Frank McLaughlin, president of the Puget Sound Power & Light Company, was recently elected vice-president of the Seattle Chamber of Commerce.

▶ Herbert I. Sackett has been elected president of the Electrical League of the Niagara Frontier. Other officers are Robert D. Glennie and George J.

BIG BUSINESS—NO. 7



Patent No. 223,898

SOME 56 years ago there began in this country an industry which is without parallel in its amazing contribution to the standard of living. It sprang from laboratory experiments to practical reality when the basic patent for the incandescent lamp was granted to Thomas A. Edison.

The high quality and low cost of electric service are accepted facts of daily life. The price of electricity—25c per kilowatt hour in 1882—has been reduced in every single year except 1918 and 1925, and stands today at 4.39c (average) for residential use, 1¼c for quantity commercial use, and ⅞c for transportation. Even since 1913, despite a 43% advance in the cost of living, the price of electricity has declined 47%.

Inventive genius and engineering skill are characteristic of the electric industries. The amount of coal required to produce a kilowatt hour has been reduced from 8 pounds to 1⅜ pounds. Filament lamps now give twenty times more illumination per watt than in the early days.

Total annual taxes paid by the industry now exceed $300,000,000 and have increased over 50% since 1929. These taxes are equivalent to:

— 75% of the industry's payroll
— 2½ times the cost of fuel
— $11 for every customer
— 67% of the net income available for dividends
— the interest on all funded debt

Further development of the electric power and light industry, with resultant benefits to national well being, depends largely upon its ability to attract sufficient capital to undertake needed expansion of plant and distribution facilities.

As bankers for commercial and industrial enterprises, it is part of our responsibility to contribute something to a better understanding of the facts about private business.

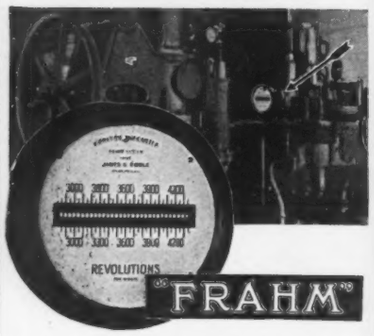
BANK OF NEW YORK & TRUST COMPANY

48 *Wall Street* · *New York*

UPTOWN OFFICE: MADISON AVENUE AT 63RD STREET

New York's First Bank — *Founded in* 1784

Copyright 1938—Bank of N. Y. & Trust Co.



VIBRATING-REED

TACHOMETERS

FRAHM Tachometers indicate r.p.m. by the vibration of tuned steel reeds. There are no rotating parts, no bearings, shafts, gears or belts; no springs, magnets or electrical connections; nothing to lubricate, nothing to wear or adjust. These simple, sturdy speed indicators

without rotating system or moving pointer

retain their original calibration for long periods, are easily mounted, require no servicing, cost little or nothing to maintain, give years of satisfactory service.

"Frahm" Hand Tachometer

Frahm Tachometers are widely used for permanent mounting on turbines, pumps, blowers, generators, motors, etc. Portable or hand types are exceedingly valuable on turbines and other enclosed machines; also for measuring strokes per minute of pneumatic hammers and drills.

Being *frictionless*, Frahm Tachometers are unique for measuring speeds of very small motors, where the ordinary type of Tachometer imposes a load and reduces the speed.

Speed ranges from 900 up to 30,000 r.p.m. For complete description send for Bulletin 1510-W.

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

Other Biddle Specialties:

"Megger" Insulation Testing Instruments
"Megger" Ground Testing Instruments
"Megger" Capacitance Meter
"Megger" Direct-Reading Ohmmeters
"Ducter" Low Resistance Testing Sets
"Dionic" Water Tester
"Frahm" Vibrating-Reed Frequency Meters
"Jagabi" Rheostats
"Jagabi" Speed-Measuring Instruments

Reichert, vice-presidents; Richard Wahle, secretary-treasurer, and Samuel S. Vineberg, manager-secretary.

•

McLenegan Will Manage Air Conditioning Institute

D. W. McLenegan, assistant commercial engineer of the General Electric air conditioning department, has been named manger of the General Electric Air Conditioning Institute by J. J. Donovan, department manager. R. D. Wood will assist Mr. McLenegan with the institute activities.

Coincident with the new appointments, Mr. Donovan announced that

the activities of the institute will be considerably enlarged, beginning immediately, with special emphasis on educational phases of its program, in an attempt to meet the demand for better trained men in all phases of the air-conditioning industry.

The institute will henceforth have a home of its own as appropriate quarters have been constructed on the roof of the present main building of General Electric's air conditioning plant at Bloomfield, N. J.

•

▶R. G. LOCKETT, formerly supervising engineer for Cutler-Hammer, Inc., Milwaukee, Wis., has become application engineer in the sales department of the I-T-E Circuit Breaker Company, Philadelphia, Pa.

▶FRED H. COLE has been appointed general manager of the Bowie Switch Company, San Francisco, according to an announcement by A. J. Bowie, president.

▶ROBERT D. STEPHENS has been appointed manager of appliance sales in the new-business department of the Central Illinois Public Service Company, Springfield. Mr. Stephens' service record dates back to 1917. With time out for attending McKendrie College from 1922 to 1926 his employment has been continuous in sales and engineering work except for a brief period in 1929 and 1930, when he was with an ice refrigerator manufacturer.

▶JOHN R. HERTZLER, manager of the air conditioning division of the York Ice Machinery Corporation, has been appointed general representative in refrigeration and air conditioning and WILLIS E. BARNUM of the Los Angeles branch office will now head the air conditioning division. The position of general representative has just been created.

OBITUARY

Dexter P. Cooper

Dexter P. Cooper, noted engineer who conceived the Passamaquoddy tidal project, died February 2, of a heart attack, in his fifty-eighth year. He and his brother, the late Hugh L. Cooper, were jointly responsible for the $35,000,000 hydro-electric plant of the Mississippi River Power Company at Keokuk, Iowa, and also for the Wilson Dam and power project at Muscle Shoals in Alabama. When Hugh Cooper went to Russia, Dexter remained in this country, devoting the last fifteen years of his life to the Passamaquoddy Power Dam.

Mr. Cooper was born at Rushford, Minn., July 10, 1880, educated in Switzerland and Germany, being graduated as mechanical engineer from the Royal Technical Institute at Karlsruhe, Germany, in 1907.

•

▶CHARLES A. IVES, for many years in charge of air brake commercial and engineering activities of the General Electric Company, died January 27 at his home in Erie, Pa. He was 59 years of age. Mr. Ives had been associated with G.E. since 1906.

▶CHARLES W. STONE, consulting engineer of the General Electric Company, died at his home in Schenectady February 3, after a long illness. He was 63 years of age. Born in Providence, R. I., he had been associated with the General Electric Company since 1900. Active in the affairs of the Radio Corporation of America since its inception, Mr. Stone was named in 1927 assistant to James G. Harbord, then president of RCA and now chairman. Mr. Stone was a fellow of the American Institute of Electrical Engineers.

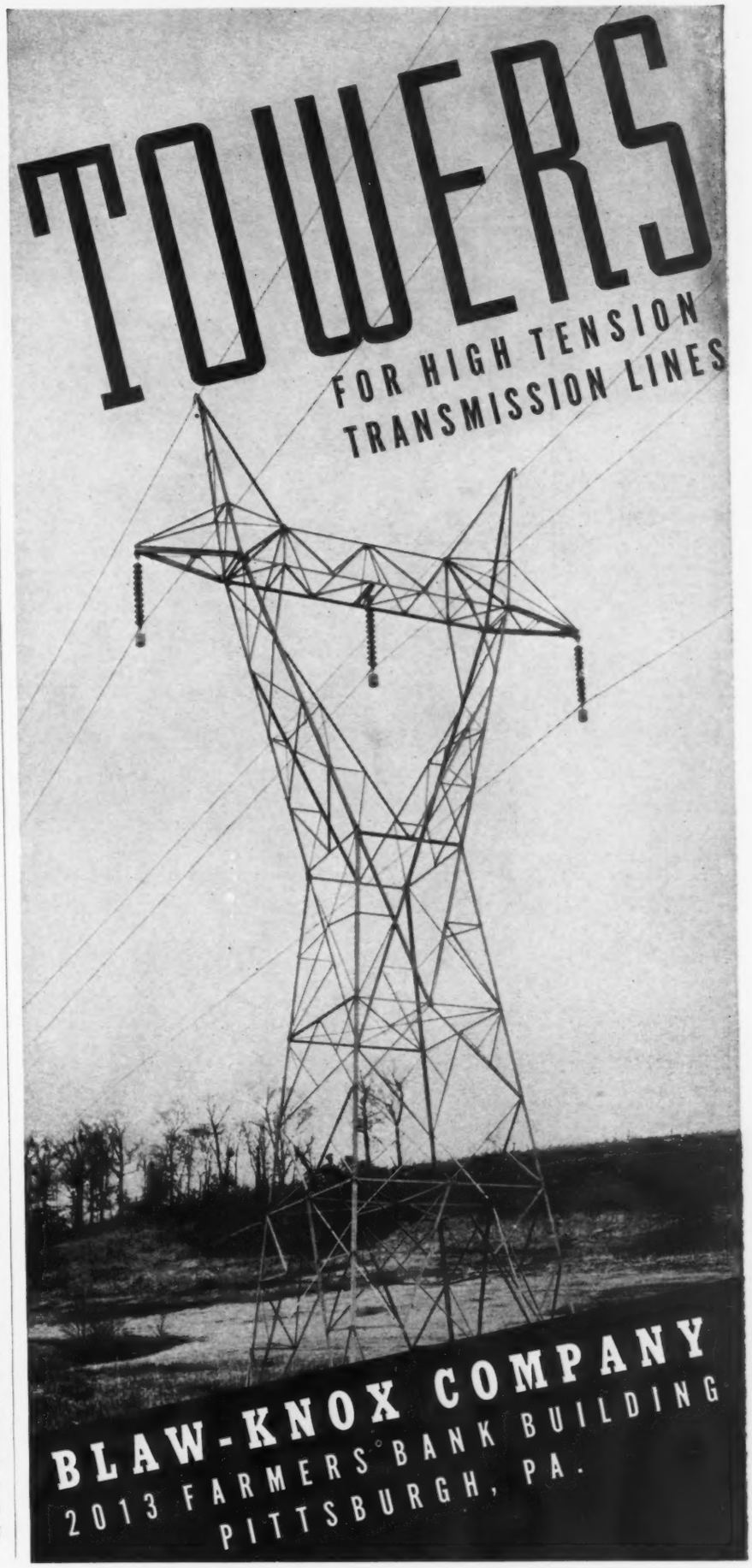
▶FRANCIS E. CABOT, formerly secretary of the Boston Board of Fire Underwriters, a life member of the A.I.E.E., and for a time prominent as a consulting electrical engineer in that city,

died suddenly, at Hanover, N. H., January 7. He was born in Brookline, Mass., in 1859, was graduated from Harvard University in 1880 and served the underwriters' board for 43 years.

▶ WILLIAM H. WINSLOW, assistant to the president of the Superior Water, Light & Power Company, Superior, Wis., died January 23 in his seventy-second year, following a long illness. He was associated with the company for 48 years, during which time he served as cashier, chief clerk, secretary and vice-president. He was a past-president of the Wisconsin Utilities Association.

▶CLIFFORD W. BATES, technical writer in the advertising department of the Leeds & Northrup Company, Philadelphia, Pa., died December 4, in his fifty-fourth year. Following graduation from Yale University in 1905, Mr. Bates was appointed to the electrical engineering faculty of Yale University as an instructor and remained at that institution until 1915, when he became an engineer in the meter and installation department of the Philadelphia Electric Company. Later he became research engineer, research assistant to the chief engineer and technical assistant to the general manager of that company. In 1930 Mr. Bates became associated with the Leeds & Northrup Company, where he remained continuously except for a brief period as assistant associate director of engineering of the Museum of the Franklin Institute.

▶EMIL E. KELLER, Detroit industrialist and electrical engineer, died January 7 at the age of 74. Early in his career he engaged in electrical construction for the Westinghouse interests in Pittsburgh. After going to Chicago and entering the electrical manufacturing business Mr. Keller was rehired by Westinghouse to become engineer and general superintendent of its World's Fair electric lighting plant. From 1892 to 1894 he was engineer for the World's Fair Department of Electricity. He returned to Pittsburgh where he held executive positions with Westinghouse units and various manufacturing companies. Thereafter Mr. Keller was organizer and president of the Detroit Insulated Wire Company, the Insulating Materials Company and the Metal Products Company, subsequently adding to his associations positions with various industrial undertakings. He was a member and a past vice-president of the American Society of Mechanical Engineers and held membership in the American Institute of Electrical Engineers, Detroit Engineering Society, the Franklin Institute and other engineering societies.



New EQUIPMENT AVAILABLE

Heavy-Duty Battery Charger

Magnesium-copper sulphide rectifiers are used in recently introduced heavy-duty battery chargers for high-capacity storage batteries, such as those used in industrial electric trucks, railway cars, emergency lighting plants and power substations. Rectifiers are mounted around a blower wheel in a d.c. "Power Dome," immediately below which is the transformer. Charger is equipped with voltmeter, ammeter and transformer primary tap-changing receptacles. Standard fractional-horsepower motor provides forced ventilation of rectifier and transformer. Charger shown is rated at 100 amp.

One of line of rectifier type battery chargers; sizes are available to charge up to 32 cells of lead-acid batteries and 50 cells of nickel-iron-alkaline batteries. **P. R. Mallory & Co., Inc.**, Indianapolis, Ind.

•

Heavy-Duty Push Buttons

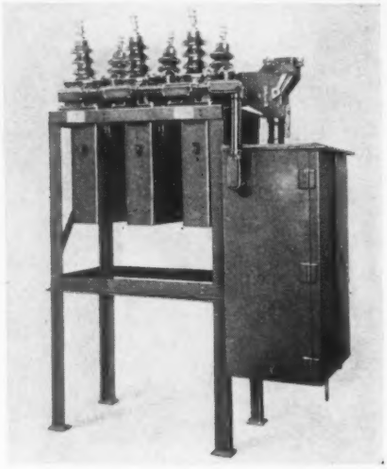
New push buttons for a.c. and d.c. control circuits are designed for heavy-duty service. There are eight different units, including lamp receptacle and rotary selector switches, which may be grouped together as desired. All units have interchangeable mounting dimensions, are suitable for built-in control or for panel mounting, and each unit is entirely self-contained. Heavily silver-plated double-break contacts are used.

"Type HD" pushbuttons. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

•

Outdoor Breaker

Special interrupting devices, "Ruptors," are used to give quick clearing of short circuits, low arc energy, low pressure and minimum of oil deterioration in this new moderate capacity outdoor oil circuit breaker of non-oil-throwing design. Additional features include silver contact surfaces, low inertia, straight-line-motion type mechanisms, one-piece, wet-process porcelain bushings. For pole or frame mounting.



Type OZ-110 outdoor oil circuit breaker; furnished for 600 amp. at 15 kv.; interrupting capacity 100,000 kva. **Allis-Chalmers Mfg. Co.**, Condit Works, Boston, Mass.

•

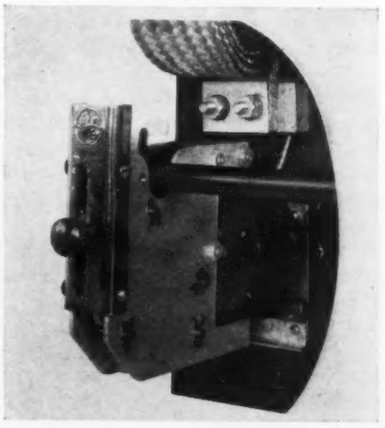
Air-Conditioning Motors

"Type RT" polyphase motors; standard sizes 40 hp. and larger. **Wagner Electric Corp.**, St. Louis, Mo.

New polyphase motors for air-conditioning service are designed for those applications or localities where double squirrel-cage motors of the larger sizes would produce undesirable voltage variations and where it is desirable to have a motor available which will meet rigid starting current requirements. Motor is said to have a locked torque of from three to three and one-half times full load current. Rotor is primary member and carries winding connected to line when motor is operating. Secondary member is stator and has two windings, one of which is a high-resistance short-circulated winding and the other a low-resistance insulated winding, as in the case of the starterless motor.

Breaker Tripping Element

New thermal tripping element for air circuit breakers consists of a magnetically operated tripping mechanism which is restrained from tripping on overcurrent by a bimetallic element having thermal characteristics said to be suitable for the starting and running protection of a.c. motors. This bimetallic unit, heated inductively from the magnetic circuit of the overcurrent tripping device, releases armature of this device when the proper tripping temperature is reached. Means of calibration of the mechanism are provided to raise or lower tripping point as desired. On overcurrents exceeding ten times normal, instantaneous tripping occurs.

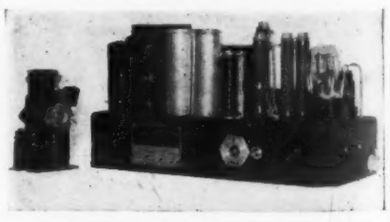


Thermal magnetic overcurrent and short-circuit trip for Type AE-1 air circuit breakers. **General Electric Co.**, Schenectady, N. Y.

•

Photo-Electric Counting

For photo-electric counting applications where it is necessary to count small objects passing a given point at a comparatively high rate of speed, a ratio differential control has been developed which multiplies the speed of a mechanical counter by a factor of 2-4-8-16, etc., depending on de-



Ratio differential control with standard Veeder-Root counter. Electronic Control Division, **United Cinephone Corp.**, Long Island City, N. Y.

ONE MINUTE RE-FUSING*

ANOTHER ADVANTAGE OF THE L-M TYPE PVD FUSE CUTOUTS

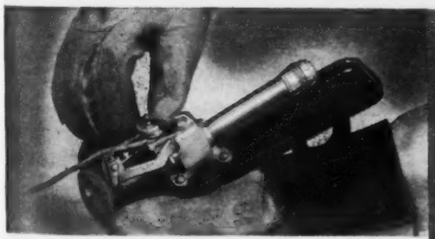
● Seconds *count* in restoring outages. On-the-pole re-fusing of PVD Fuse Cutouts not only cuts down outage time, it is a safe, easy operation. To start it, your lineman opens the PVD Bakelite Door and lifts it off the dead hinge in one easy motion. And Re-Fusing the PVD is Simple.

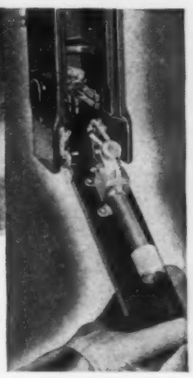
1. REMOVE THE BLOWN LINK

Just unscrew the fuse cartridge cap and pull the blown link out.

2. INSERT A NEW FUSE LINK

It slides into and through the PVD Fuse Cartridge without a hitch.





3. FASTEN THE NEW FUSE LINK

Pulling new link over the Spring Actuated PVD Throwout Device and making it fast requires a few seconds only.

4. RECLOSE THE PVD DOOR

The PVD Door hooks on its hinge and swings shut in one continuous, easy movement.

* *Six seconds* is plenty of time to re-fuse the PVD when the lineman has a spare fused PVD Door. He just opens the old door, lifts it off and slams on the fused door. PVD Fuse Cutout Doors are perfectly interchangeable.

And there you are . . . . The PROTECTED PVD!

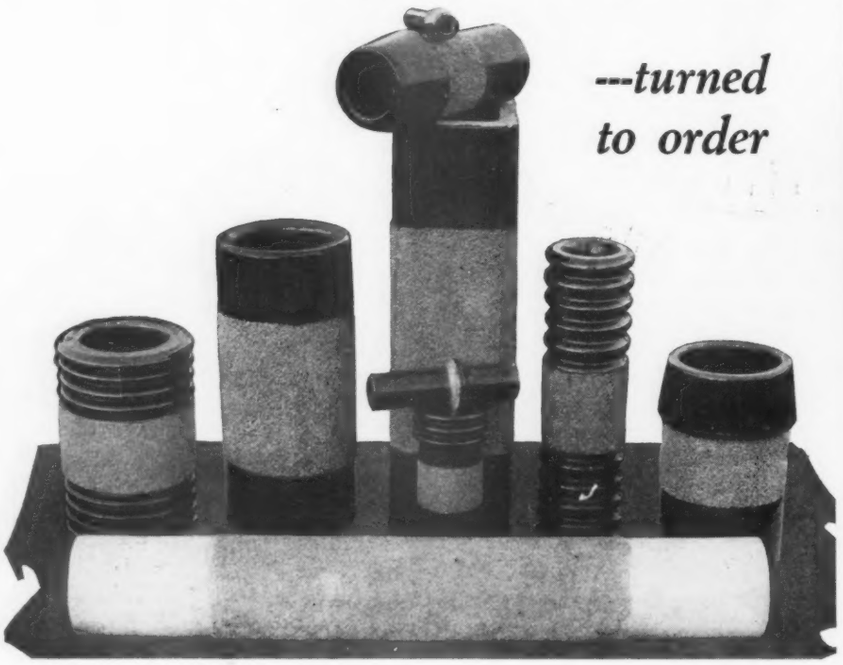
Rain, snow, sleet, dirt and foreign matter don't get at PVD contacts. The PVD Bakelite Door stays closed, sealing out weather and dirt, whether the cutout itself is in fused or blown position.

LINE MATERIAL CO.

THOMAS

Special Porcelain Bushings

The Right Type for Any Need



---turned to order

If the Thomas line of Tubes & Bushings does not include the exact items you require . . . please remember we maintain a modern Special Bushing Department of ample capacity to meet most exacting requirements.

Use Thomas Porcelain Bushings where precision and quality insulation is essential to Electrical Equipment because all Thomas Bushings are carefully and accurately made of highest quality wet process porcelain which insures dependable performance under all conditions.

Immediate cooperation is offered on receipt of your specifications.

THE R. THOMAS & SONS COMPANY

ENGINEERS · MANUFACTURERS · DESIGNERS

Established 1873

LISBON, OHIO, U. S. A.

OFFICES: - NEW YORK - BOSTON - CHICAGO

GRAYBAR ELECTRIC CO., INC., Agents

Incorporated 1892

sired ratio of counting to counter speed. Device furnishes one impulse to final counter circuit for definite number of interruptions of light beam. With the control, counter is energized and de-energized just 50 per cent of the time, regardless of percentage of time beam is interrupted. Standard "scale of two" control with "Veeder-Root" counter will safely count up to 5,000 per minute, it is said.

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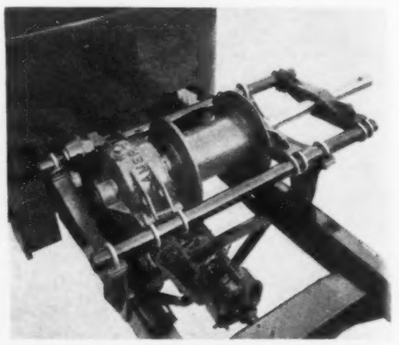
Vacuum-Controlled Winch

Entire operation of this new vacuum-controlled winch is performed from the driver's seat, gear shift controls, winch clutch and free drum brake lever being at the driver's fingertips. Through medium



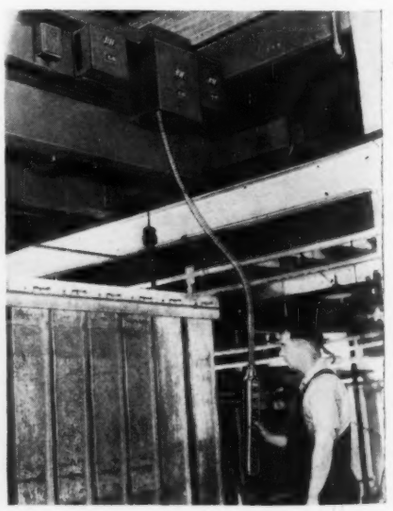
Series 75-CB vacuum-controlled winch; adaptable to any frame width of any style chassis; capacity, 15,000 lb. constant single line pull. **American Coach & Body Co.**, Cleveland, Ohio.

of a hand control valve on dashboard, vacuum from motor's intake manifold activates plunger in vacuum chamber on winch, disengaging clutch and applying free drum brake in one operation. Clutch is engaged and brake released by return movement of lever control. Self-energizing, full automatic worm brake is said to insure positive irreversibility of winch at all times.

•

Hoist and Crane Control

To overcome the disadvantages of the pendant rope-operated face-plate or drum-type variable controllers used with floor-operated hoists and cranes, this company developed a push-button variable speed controller. Five control steps are provided and the element is designed so that it can



"P&H" push-button master variable speed controller; adaptable for either a.c. or d.c. slip-ring motor operation. **Harnischfeger Corp.**, Milwaukee, Wis.

Type AP-1, -2
7500/12,500 Y and 15,000 volts

Single-, Double-, and Three-Pole Units

Like the large oil circuit breakers, the Pacific Electric Restorers clear a short within eight cycles and reclose the circuit within thirty cycles after the short occurs. They may be adjusted for immediate reclosure and two further reclosures (one to ten seconds) with final lockout after the third reclosing. A visible device indicates the number of operations which have taken place.

The wind may swing wires together or a branch may fall across a line for a moment—do you want one-hour outages or one-second?

Ends Stop-and-Go Service Gives Better Public Relations!

Pacific Electric Automatic Service Restorers Fill a Big Need

Many present-day overhead distribution systems do not provide maximum reliability of service because fuse protection still means s t o p - a n d - g o service for customers.

So equipment which brings about closer control of distribution systems and more dependable service is welcome.

The inexpensive Type AP-1, -2 Service Restorers overcome outages because they restore service instantly through automatic operation. When insufficiently protected lines go out, it costs the utility time in handling complaints; brings economic loss to customers in business or in factories; causes loss of home comfort, loss of revenue and loss of goodwill.

Safer

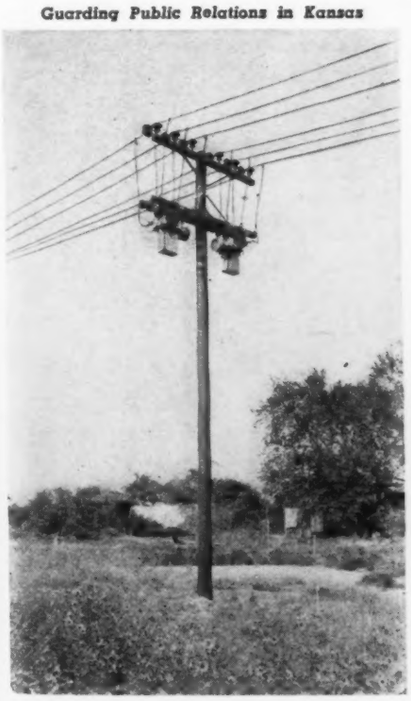
Pacific Electric Restorers offer maximum safety because they do not emit flashes which may damage equipment, start fires or injure linemen. There are no live parts to handle. They operate satisfactorily under all weather conditions.

Single-phase operation of three-phase equipment is prevented by the simultaneous opening of all poles of three-pole Restorers. The use of ordinary single-pole devices cannot prevent single-phase operation on poly-phase circuits.

Made Only By Pacific Electric

Precision-built with a high-speed Expulsion Chamber Contact with wet-process stud-type interchangeable bushings, Pacific Electric Restorers are proving reliable, are cutting maintenance costs from coast to coast. Send for new Bulletin No. 58. Get the full facts and then enjoy better public relations now when goodwill is of utmost importance.

Guarding Public Relations in Kansas

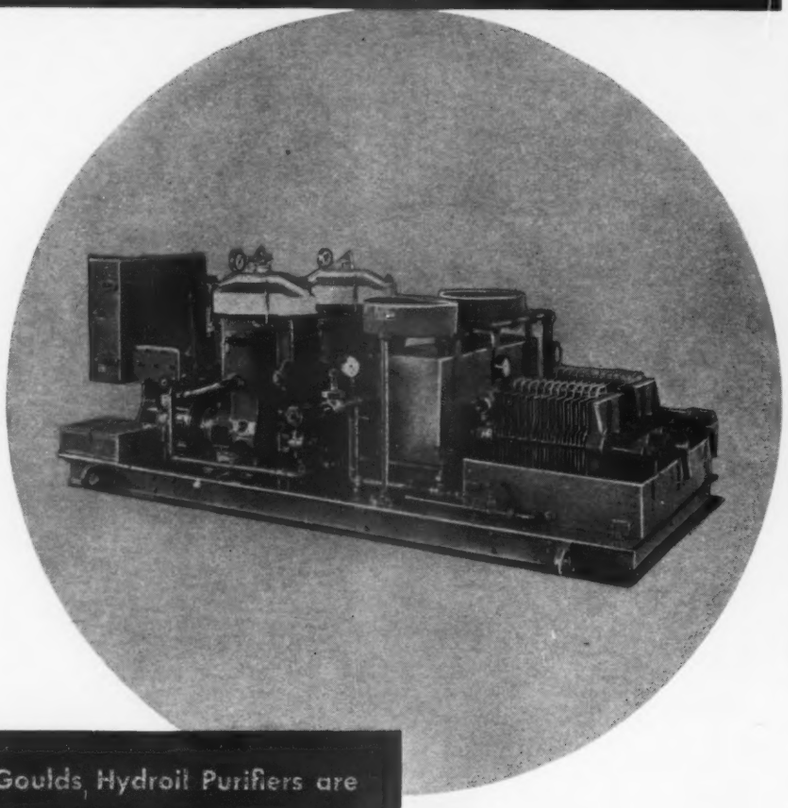


Pacific Electric Mfg. Corporation

5815 Third St., San Francisco — Dunes Highway, Gary, Indiana

Representatives in Principal Cities

GUARD YOUR SERVICE



Goulds Hydroil Purifiers are also particularly adapted for the purification of turbine and other insulating oils.

GOULDS Hydroil Purifiers, by centrifugal action, remove water and other contaminating material from oils used in transformers, circuit breakers and switches.

Many leading power companies realize that periodic centrifuging maintains insulating oils at the high dielectric strength necessary for safe, efficient operation of high tension equipment—and at low cost. With a Goulds Hydroil Purifier, you too can safeguard the service that produces your profits.

Made in sizes to meet every requirement, Goulds Hydroil Purifiers are designed for permanent installation or portable use. For details—write for bulletin No. 503.

8106

GOULDS PUMPS Inc.

SENECA FALLS N. Y.

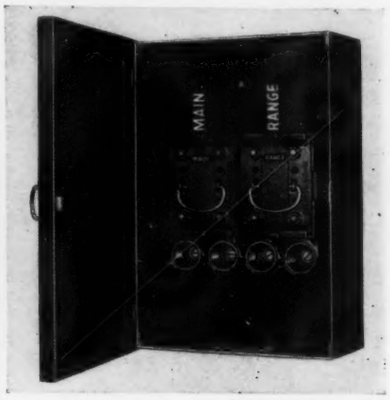
ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA, Representatives in all Principal Cities

be grouped into push-button case with the groupings of the elements dependent on the number of motions controlled. Control is offered only on company's equipment.

•

Service-Entrance Equipment

Range, lighting and water heater circuits are provided in this service-entrance equipment, with fusible or non-fusible pull cover for the main switch unit. Reversible



Switch; catalog No. 60MR4. **Wadsworth Electric Mfg. Co.**, Covington, Ky.

feature of cabinet permits mounting so that circuits can be brought out at the bottom or at the top. Molded Bakelite construction is used throughout interior mechanism. Range "Renu-Fuse" switch unit is available in either 30- or 60-amp capacity.

•

Temperature Control

Remote temperature resetting device for "H&B" all-range temperature controller. **H. O. Bushnell, Los** Angeles, Calif.

Electric-driven temperature resetting systems for use with this company's all-range temperature controller permit varying the temperature control point at instrument by any amount through operating buttons on a remote-control panel. Pilot lights are used to indicate possible failure of power supply. While the devices are electric-driven for regular industrial applications having 110 volts a.c. available, they may be air-driven for use in inflammable areas.

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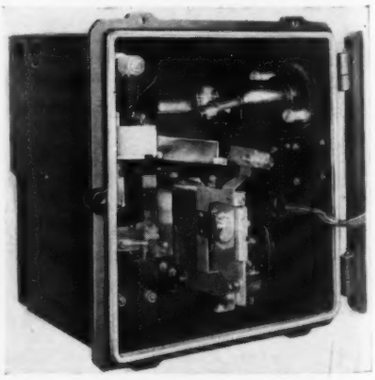
Throttling Controller

New throttling controller for electric furnaces and ovens is an indicating potentiometric controller with photo-electric detection of the position of a light-beam



"Celectray" indicating photo-electric controller. **C. J. Tagliabue Mfg. Co., Brooklyn, N. Y.**

A PICTURE OF MODERN LIGHTING *for profits*

Seeing in this shop is proof that higher illumination makes it easier for workers to see without effort. Production is faster . . . and errors are at a minimum . . . because eye-strain and its resultant fatigue are greatly reduced.

Better light is recognized in modern industry as an extremely valuable production "tool." It directly improves the efficiency of every worker and every machine. Bear in mind, too, that no other comparable light source gives as much light per watt as these modern light sources.

Investigate General Electric Type-H Mercury Lamps if you are interested in the profits that better light can assure. They are adapted for use on either 115- or 230-volt lines. They may be combined with incandescent lamps to produce a light which simulates and blends well with daylight. Write for complete information.

The 400-Watt Mercury Lamp is 60 to 140% more efficient than other available light sources. It burns vertically only.

By combining Mercury and Incandescent Lamps in many conventional type luminaires, a psychologically cool, white light can be obtained.

GENERAL ELECTRIC

General Electric Vapor Lamp Co.
805 Adams Street, Hoboken, N. J.

863H

Incandescent Lamp Department
Dept. 165, Nela Park, Cleveland, Ohio

Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Company.

reflected from a mirror galvanometer toward a reciprocating "controlling edge." Instrument is said to have no measurable dead zone and to hold a steady temperature. Safety feature of controller is that when lamp is burned out power is shut off. Scale appears through glass window and temperatures are indicated by white, red or green line of light on ground glass.

•

Foot Control Switch

"Two-in-one" safety foot control; for motors up to ½ hp. **The Babaco Co.**, New York, N. Y.

New motor control switch for individual motor-driven machinery is designed to be operated by foot, leaving the operator's hands free to hold the work. To start the motor with this switch, operator depresses foot pedal, which starts the motor. To stop the motor, foot pedal is again depressed. An additional safety feature of the switch is that by depressing the foot pedal and holding this pressure, switch will operate only while the operator retains his foot, and will automatically shut off the motor once pressure is removed.

•

Photo-Electric Inspection

This machine, for inspection of tin can ends, is one of those recently developed by this company for photo-electric control of industrial processes. Tin-can ends pass through this machine on their way to the can-making machine. As they pass toward the left-hand side one of the two

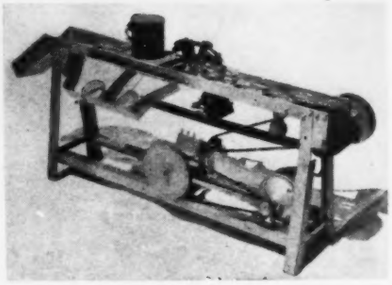


Photo-electric can end inspector. **Electronic Products Co.**, St. Charles, Ill.

photo-electric assemblies tests for missing gaskets and operates an electric solenoid to push the defective end into the lower of the two can chutes. The other assembly tests for small spots of rust or grease on the ends and operates in a similar manner to eject the can end into the upper chute. Perfect can ends pass along the belt and are discharged at the upper end. Small motor furnishes conveyor drive.

•

Variable-Speed Transmission

Variable-speed transmission; available with pulleys of 6½, 4½ and 3½ in. outside diameters. Speedmaster Division, **Continental Machine Specialties, Inc.**, Minneapolis, Minn.

A six to one variation of speed is given by this variable speed transmission, announced as a companion to this company's previously reported unit which provides a 45 to 1 variation (ELECTRICAL WORLD, December 11, 1937, page 17). It is designed for installation between the motor and driven machine and uses standard "V" belts, running on Bakelite pulleys. Hand wheel serves to change speeds; supporting angle frame affords convenient mounting. Units may be used for fractional-horsepower installations or for driving with 4 or 5 hp.

Maximum performance ... at minimum cost!

● **The new series-600 Hemingrays are accurately manufactured to controlled specifications, assuring an always uniform product for unfailing service throughout the years. This new design in Hemingray Glass gives you an all-around better insulator for use on distribution primaries—greater leakage distance assures outage-free performance even under severe weather conditions.**

Now is the time to get acquainted with this superior product. Low-cost, dependable service will back your judgment in specifying the series-600 Hemingrays. Send for samples of these brass-bushed insulators—test them mechanically and electrically—learn their greater service advantages. Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

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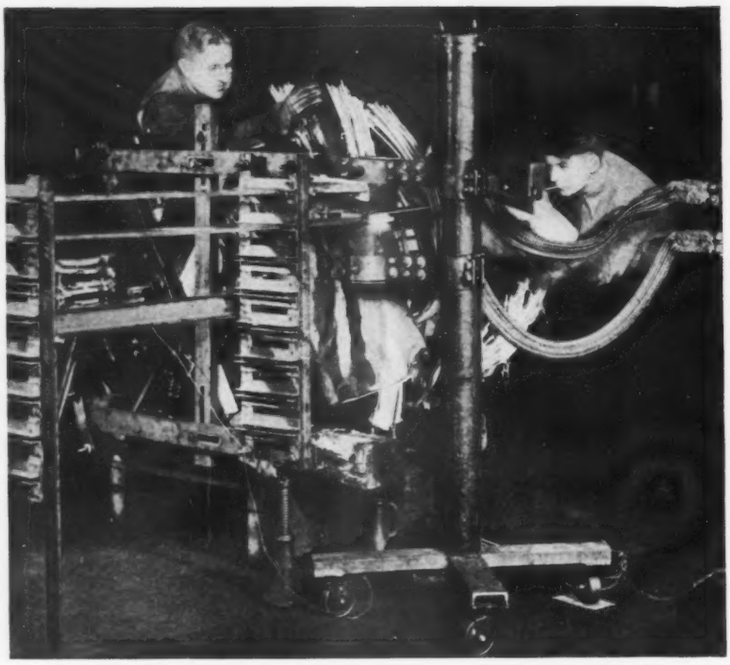

Heavy secondary leads electro-brazed directly to heavy copper bars by a process which results in a joint as reliable as the copper itself. This operation, being practically instantaneous, prevents conducting of heat from joint to interior of winding.

...one of many reasons for Pennsylvania reliability

Every step in fabrication is characterized by painstaking workmanship and careful supervision. Design, construction, inspection and tests are all conducted in our own plant, resulting in the co-ordination of every detail, and in the assurance of reliability in every transformer. Write for Bulletin 340.

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Municipal Plants

JACKSONVILLE, ILL.—Plans will be completed about March 1 for the construction of the proposed municipal light and power plant and distribution system to be financed through PWA funds, according to an announcement by City Engineer K. K. Stapleton. It has been estimated that the power plant building, oil house and switching station will cost $35,000, the power plant equipment approximately $180,000 and the distribution system $167,000. Warren & Van Praag, Inc., Decatur, Ill., are the consulting engineers for the project.

ITTA BENA, MISS.—City officials are planning construction of an electric light plant. W. A. Fuller & Company of St. Louis are engineers in charge. The cost has not yet been announced.

DESHLER, NEB. — Southern Nebraska Power Company won the right in the state supreme court to continue operating its electric distribution system in this village. The high tribunal vacated a mandatory injunction of the Thayer County district court ordering the power company to remove all of its equipment, which the village obtained on the ground that a "purported franchise ordinance" was invalid. "The evidence shows," Justice E. F. Carter wrote, "that defendant (power company) has expended a sum in excess of $20,000 in improving its electric plant and distribution system, exclusive of maintenance costs. Defendant has operated within the village for more than twenty years without objection on the part of the village or anyone under the assumption that it had a 25-year franchise. During all of this period the village has stood by and done nothing, permitting the defendant to construct and improve its works and enter into contracts with the public generally, even with the village itself."

MINATARE, NEB.—District Judge Donohoe in Omaha recently heard arguments over the right of the town to vote bonds for a new electric distribution system. Attorneys for the Western Public Service Company, which obtained a lease until 1941 on the publicly owned plant, argued the company should be allowed "quiet enjoyment" of benefits of the lease until its expiration. C. A. Sorenson, Lincoln attorney representing the town, asked dismissal of the suit, claiming city officials had no right to negotiate a lease as was done in 1916 without popular vote.

PLATTSBURG, N. Y.—Supreme Court Justice Ellsworth C. Lawrence has issued a temporary injunction restraining this city from issuing $360,000 in bonds to finance a municipal power plant. The injunction was issued on motion of the New York State Electric & Gas Company, which argued that the city's bonded debt limit would be exceeded if the bonds were issued. Wallace Pierce, the company's counsel, said the company opposed the bond issue as a taxpayer and not as a possible competitor of the proposed municipal plant.

ROBSTOWN, TEX.—Taxpayers at a recent election voted favorably, 263 to 75, for the issuance of $350,000 bonds, the proceeds to be used in the construction of a municipal electric light and power plant and natural gas distributing system.

NORWALK, OHIO—Former Mayor C. M. Schock has filed a petition with 361 signatures calling for a referendum vote on the question of whether the city power plant is to continue to expand its field

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** AN INDUSTRIAL POWER USER ASKS– "We would like to know where to get additional information on the subject as outlined in attached * clipping.

** AN INDUSTRIAL POWER USER ASKS– "If possible please send us more information regarding the galvanizing process as mentioned in your * Vol. 2. Pg. 24."

** AN INDUSTRIAL POWER USER ASKS– "We will be pleased to have you send us information on the application of the electric eye for measuring turbidity in water as listed on page 18 of last issue of *"

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$1,000 **AND A NATIONAL CUP FOR OPERATING UTILITY COMPANIES.** This award is for the best all-around water heater job in 1938. Contest closes December 31st, 1938.

$1,000 **FOR TECHNICAL PAPERS BY UTILITY EXECUTIVES AND ENGINEERS.** Subject: "Advisability of Competitive Water Heater Rate and Advantages of Water Heater Load." Closes May 1st. Two prizes of $500 each.

GET YOUR SHARE OF THE PRIZE MONEY. All operating utilities and local Modern Kitchen Bureaus have received detailed information and rules for all five contests. Ask about them . . . or write to

National Electric Water Heating Council

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outside the city limits. Only 278 names were required. The referendum action is the result of the controversy that has arisen over the extension of service to Milan, Ohio, and to several other outside fields.

CLARKSBURG, W. VA.—W. H. Rudisill, retained by city council to report on the feasibility of establishing a municipally owned electric power system, estimated that a saving of between $19,000 and $31,000 annually would be possible.

FRIENDSHIP, WIS.—Wisconsin Power & Light Company has started proceedings in Dane County circuit court to force the state Public Service Commission to agree to have the village discontinue municipal acquisition proceedings. The commission held void the decision of the village board to discontinue action to acquire the local electric plant, pointing out that the state supreme court in the Shullsburg case definitely established that once a municipal acquisition proceeding is started by a city or village it can be discontinued only under provisions of the acquisition law.

•

Recent Rate Changes

BUFFALO NIAGARA ELECTRIC CORPORATION has filed a uniform and reduced general commercial rate with the New York Public Service Commission which has been permitted to take effect February 1 in the entire territory of the company, including the cities of Buffalo, Lackawanna, Niagara Falls, North Tonawanda and Tonawanda and the surrounding villages and towns in Niagara and Erie counties served by the company. Customers of the company will secure a net saving of $202,400 annually by the new uniform general rate. In the area of the former Buffalo General Electric Company over 6,300 users will save $185,250 a year while about 15,000 will be unchanged. In the area of the former Tonawanda Power Company over 180 users will save $7,420 while 980 will be unchanged. In the territory of the former Niagara Electric Service Corporation, including the city of Niagara Falls, more than 1,400 users will save $21,670 a year while 330 will be unchanged and 800 will be increased by a total of $11,940.

ARKANSAS POWER & LIGHT COMPANY has been ordered by the state Utilities Commission to reduce its electric rates $271,869 annually in more than 285 cities, towns and communities in 55 counties. The new rate is effective on all bills on or after February 1. The commission last July ordered a state-wide investigation into rates of the company. Chairman Thomas Fitzhugh stated that the new schedule was the first step in the investigation. He emphasized that the new rate was "in no way a settlement of the Arkansas Power & Light case." The bulk of the rate reduction will go to residential consumers with bills of this class cut $121,334. Of the total, $63,596 goes to Little Rock consumers and $192,902 to those outside the capital city. Commercial subscribers will save $91,449; commercial and small power consumers will net $4,384; small power consumers will realize $24,431; combined lighting and power subscribers will save $14,900 and churches and schools will be given a total reduction of $15,371.

TIDEWATER POWER COMPANY has reduced its electric rates $51,200 annually, according to an announcement by the North Carolina Utilities Commission. The reductions became effective with meter

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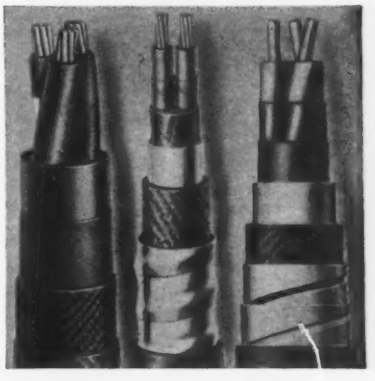
Our Steel-Taped Parkway Cables have rubber insulated conductors protected by a lead sheath and by one or more layers of metallic armor. Use our Armorlokt or flat steel-taped metallic cables wherever added mechanical protection is necessary. For complete information, send for our new Parkway Cable catalogue.



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Here's the new "Chicago" Grip capable of handling messenger or guy strand from 3/16 in. diameter up to 1/2 in. diameter. A genuine all purpose grip that can also be used satisfactorily on bare conductors, solid or stranded, from No. 6 to No. 4/0 seven strand copper and A.C.-S.R. up to No. 3/0. A grip that even satisfactorily handles the new three-strand "copperweld" conductor. The bronze-lined jaws prevent slippage. This new grip will afford a sure hold under all conditions, with loads up to 8,000 lbs.

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readings after February 1. The company serves 124 cities, towns and villages in North Carolina. Commissioner Stanley Winborne stated the new residential rate in New Hanover County would show the greatest reductions for the consumers using around 35 kw.-hr. a month. The old rate for 35 kw.-hr. was $2.80, the new will be $2.28. In the territory outside of New Hanover County, the greatest reduction occurs at around 20 kw.-hr. a month. The old rate for 20 kw.-hr. was $2 and the new will be $1.70.

OKLAHOMA GAS & ELECTRIC COMPANY has filed with the Arkansas Utilities Commission a standard rate schedule for street lighting service in five towns served by the company in Arkansas. The new rates will bring about an annual reduction of $750 in these towns, which are Fort Smith, Van Buren, Alma, Mulberry and Charleston. The company also filed a revised combination light and power rate for commercial customers at Ozark, Ark.

ENDICOTT, N. Y., municipal plant has been ordered by the Public Service Commission to reduce its electric rates to save customers about $12,000 annually. The reduction was directed as the result of a rate proceeding instituted by the commission after reports had shown that the plant had been earning from 21 to 29 per cent on the book cost of its property used in electric operations in the years from 1932 to 1937. Under the rates recommended by the commission to be made effective immediately the $12,000 annual saving to consumers will be divided so that residential customers of the village plant will save $5,500 a year, small commercial users will save $3,300 a year, power customers will save $900 annually and large users will save about $2,300 annually.

IPSWICH, MASS., lighting commissioners have reduced rates of electricity for power by an average of 13 per cent, after reducing household rates last year. The commissioners stated that increase in sales has made possible the reduction in rates.

WISCONSIN PUBLIC SERVICE COMMISSION has authorized an annual $9,000 reduction in electric light rates for Jefferson consumers. The new rate schedule, which became effective with January meter readings, provides for a fixed charge of 60 cents plus 50 kw.-hr. at 2½ cents each, next 150 kw.-hr. at 2 cents each, and all over 200 kw.-hr. at 1.5 cents per kilowatt-hour. In addition to revising domestic rates, the municipal plant has also revised its rates for electricity used by business houses, industries, for street lighting and for air beacon lighting.

●

Rate Probe Discontinued

Massachusetts Department of Public Utilities has discontinued its investigation of the rates and charges for electricity sold by the New Bedford Gas & Edison Light Company. In its order the Department stated that on December 1, 1936, a new schedule of rates became effective, resulting in a saving of $190,000 annually to all classes of customers. On June 1, 1937, another new schedule was filed for power customers, resulting in an annual saving of approximately $144,560. Under these circumstances, the Department found that further investigation was not warranted at this time.

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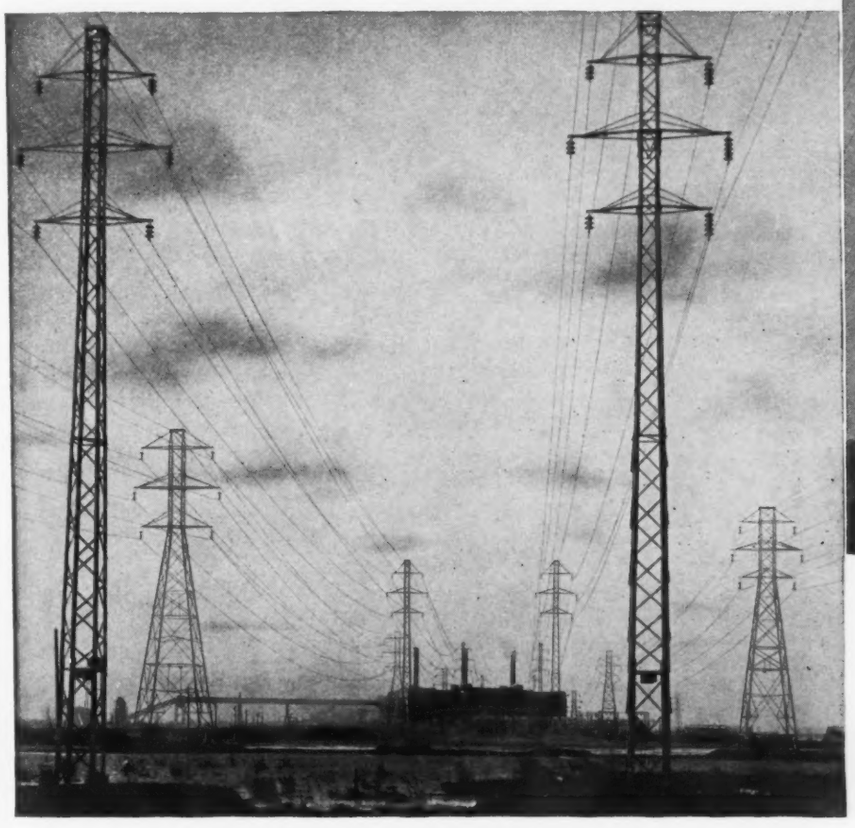

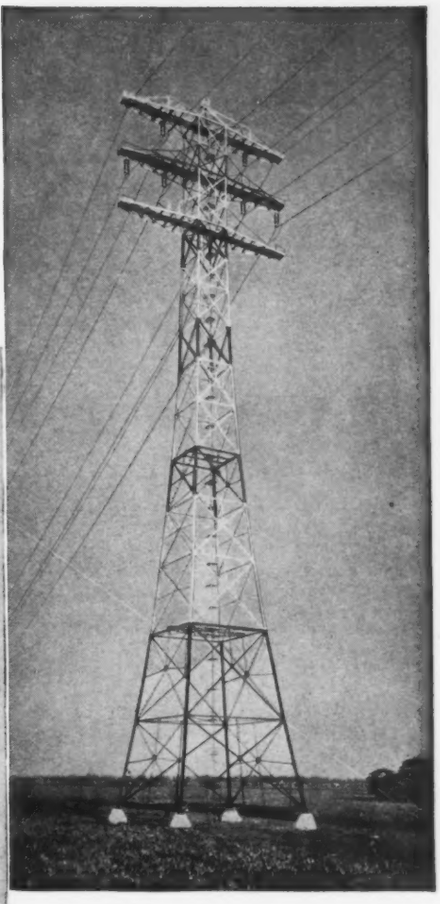

Mississippi River Crossing of the Baton Rouge Electric Company carries power lines 3750 feet between towers. Crossing designed by Stone & Webster Engineering Corporation. Steel towers fabricated and erected by American Bridge Company.

Left Power lines of various voltages radiating from the Deepwater Power Plant in New Jersey.

THE growth of electric transmission lines, spreading fanwise from hundreds of strategically located generating plants, symbolizes our national development. These lines bring service — light, heat and power—to industrial centers and rural districts.

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LONG ISLAND CITY, N. Y.

SPLICING SLEEVES

Upper Salmon Falls Harnessed for Power

[*Continued from page 54*]

to the top of the turbines, governor servo-motors, turbine gate operating equipment and turbine guide bearing.

Below the operating room is the 12½x60-ft. pump room. In this room are located the governor oil pumps, governor oil sump tank, air compressors and receivers, service water pumps, sump pumps, air washer and chlorinator for the water system.

Access to the scroll cases, draft tubes and pump sumps is provided through a 15x21-ft. inspection room located below the pump room. Tunnels from this room lead to manway doors in each scroll case. Manholes in the floor connect with the draft tubes.

Operating and pump rooms are each heated with two 15-kw. electric heaters. Heaters are controlled by thermostats. A 2,000-cu.ft. air washer is installed for station ventilation.

The water system consists of two 150-g.p.m. pumps and a 30,000-gal. storage tank. Water is taken either from the forebay or from number one scroll case. The distribution system includes operators' village, station use, generator air coolers and generator thrust bearing cooling. A chlorinator on the discharge side of the pumps treats the water for domestic use.

All interior walls and ceilings are painted with a gloss paint. On the side walls is an olive green dado ending 3 ft. above the floor. In contrast with the dado the walls are light buff to within 18 in. of the ceiling, which is painted a cream.

The substation is located in the yard to the south of the station structure. A dry riprap wall, 200x 25 ft., sustains the yard fill on the river side. The 73x80-ft. substation yard is surrounded by an 84-in. galvanized wire fence. The transformers are located on the north side. A track leads from each transformer foundation to the gantry crane for moving the transformers under the crane. Two galvanized steel structures support the transformer 132-kv. air break switches. The 132-kv. bus is supported on Lally columns. A galvanized steel tower serves for deadending the transmission line and connecting it to the 132-kv. bus.

A 132-kv. transmission line approximately 30 miles long connects the Upper Salmon development to the 132-kv. Shoshone Falls system.

Extensive diamond drilling

Part of the regulating dam was built in 1931, at which time diamond drill holes about 100 ft. deep were sunk 50 ft. apart over the dam site. The stratified hard basalt rock, of good texture, weighs about 190 lb. per cu.ft. Grouting of foundations extended throughout the length of the flood control section and particularly along the north abutment. Grout holes on 10-ft. centers and about 20 ft. deep were sunk along inside face of lower canal walls, which join with the power

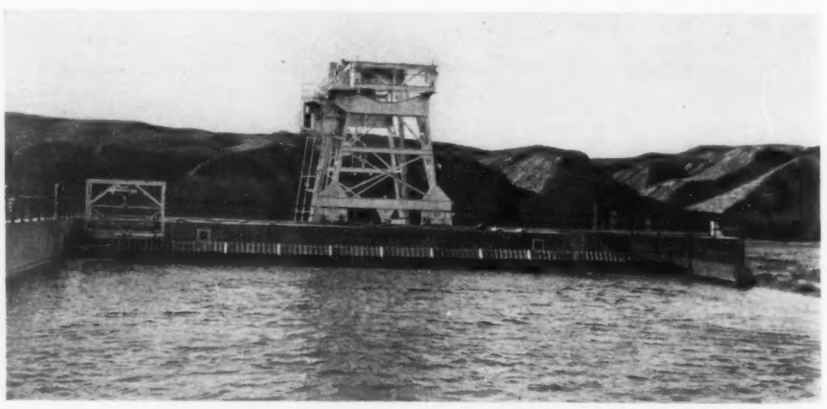

Fig. 5—Trash racks and gantry crane

Trash racks in front of the scroll case openings are 110 ft. wide by 44 ft. deep. These are in panels 9 ft. wide by 14 ft. long, which slide in structural steel guides, there being twelve sections of three panels each. The panels are made of 2-in. extra-heavy galvanized pipe, spaced 11 1/6 in. and welded to a structural steel frame. Trash, handled by means of a mechanical rake, is hauled up the racks and deposited in a trench in the intake operating floor. Water for carrying away the trash is admitted to the south end of the trash trench through a tunnel and sluice gate in the south canal wall. Trash is deposited in a collecting basin on the north side of the station, where it is burned after drying.

house, and along the base of the trash racks on the upstream side of the power house to prevent seepage from the canal in the power house area. The power house foundations were sealed with cement grout as well as the construction joints between the pours of concrete in the power-house structure.

Work done by contract included the diversion dam, lower spillway and fish ladder, canal, lower canal walls and spillway, power house and tailrace excavation, roads, power house cofferdam and transmission line. The Morrison-Knudsen Company and H. E. Cornell of Boise, Idaho, and D. J. Cavanagh of Twin Falls were the principal contractors, with whose co-operation the rapid schedule was maintained.

E. A. Woodhead was field superintendent of construction, the work being done under the general supervision of H. L. Senger, chief engineer.

Details of Equipment

Each of the two main units consists of a vertical-shaft turbine direct connected to an outdoor generator.

Turbines are S. Morgan Smith single-runner, wicket-gate, rated 13,000 hp. at 44 ft. net effective head and 138.5 r.p.m. Runners are the Smith-Kaplan type, having four blades. Maximum diameter of the runner is 12 ft. 6¼ in., and its weight completely assembled on the shaft is about 55,000 lb. The turbines are set in concrete scroll cases.

The governors, S. Morgan Smith, are oil-pressure-actuator type, having a capacity of 80,000 ft.-lb. They are designed to operate the gates over full range in three seconds and are sensitive to a speed variation of ¼ of 1 per cent.

Generators are General Electric and Westinghouse, each 9,000 kva., 9,000 kw., 1.0 power factor, three phase, 60 cycle, 6,900 volts, 138.5 r.p.m., totally inclosed for outdoor service, with direct connected 125-volt main and pilot exciters. Each is equipped with an automatic voltage regulator of the rheostatic type. They are Y-connected with the neutral grounded through a disconnecting switch.

Self-ventilating, the units recirculate air through closed duct systems located on opposite sides of each unit. Each ventilating duct is equipped with a 75-deg. C. surface air cooler. Cooling water can be supplied from either the forebay, service water pumps or tank.

Thrust bearings are Kingsbury, water-cooled. The G. E. unit has a 49-in. bearing, carrying 246 tons, including 158 tons of hydraulic thrust. The Westinghouse unit has a 56-in. bearing carrying 230 tons, including the same hydraulic thrust.

Transformers consist of two Allis-Chalmers 9,000 kva., three-phase, 60-cycle, outdoor-type, self-cooled, 138,000/6,600 volts. They are Y-connected on the high side, delta on the low. Each is equipped with three bushing-type current transformers, 100/5-amp., installed on the high-voltage bushings.

Each generator and transformer is con-

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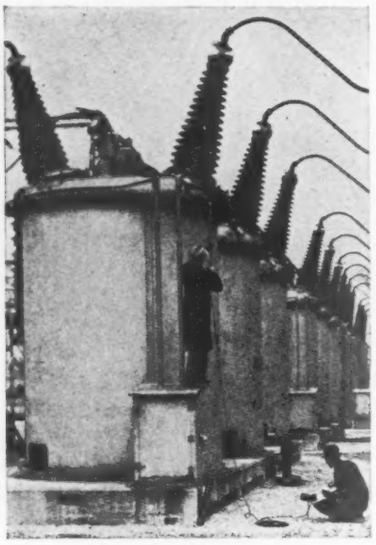

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DESCRIPTIVE BROCHURE FREE . . A valuable handbook of localized lighting.

nected to form a generator transformer unit and the two units are paralleled on the high-tension side of the transformers.

Switching equipment for each unit consists of a 15,000-volt, 1,200-amp., 100,000-kva. interrupting capacity, three-pole single-throw, electrically operated oil circuit breaker and three indoor gang-operated disconnecting switches, 1,200-amp., 2,500-volt, single-pole, single-throw, for generator control, together with a three-pole, single-throw, motor-operated, 132,000-volt, 600-amp. air-break switch for connecting the transformer to the 132-kv. bus. The switchboard consists of two duplex steel panels with fixed front instrument sections and a hinged rear relay section. Each generator oil switch and instrument transformer is mounted in a separate cubicle.

Relay protection for each unit consists of a differential loop around the generator and low-tension equipment and also a differential loop around the generator and main transformer. Induction relays operated by current transformers in the generator neutral give overload protection. The neutrals on the 132-kv. side of the transformers are grounded through a 15,000-volt, 40 to 5-amp. outdoor current transformer for ground relaying on the transmission line.

Small Steel Switch-house Effects Savings

[*Continued from page 59*]

the top of the switch-house at one side through bushings of special design. The feeder circuit leaves through similar bushings, also on top, but at the opposite side. A further improvement contemplated for the next installation consists of placing bushings at an angle, thus increasing clearance and safety at terminals outside the house.

Contained in a switch-house are a solenoid-operated oil circuit breaker and instruments and instrument transformers essential to metering, clearing the feeder and re-establishing service in cases of transient trouble. The breaker is over-size to insure ability to withstand current surges, being of 600-amp., 15,000-volt rating, for 200-amp., 4,150-volt service. Wiring and entrance bushings are insulated for 15,000 volts.

Within each house is a 1x30x36-in. ebonite panel, mounted on a swinging frame for easy access to its back. Each panel carries three IAC relays for overload protection, an ACI recloser, three ammeters to indicate current in each phase, one wattmeter, three tripping reactors, pilot lights to indicate position of the breaker and manual operating switch.

The breaker is reclosed by d.c. furnished through a full-wave copper-oxide rectifier.

Westinghouse Establishes Dielectrics Fellowship

Announcement has been made by Dr. Edward R. Weidlein, director of Mellon Institute, Pittsburgh, of the establishment of an industrial fellowship by the Westinghouse Electric & Manufacturing Company for the study of problems in the field of dielectrics and electrical insulation. Dr. Robert N. Wenzel, a member of the Mellon Institute research staff since 1927, has been appointed fellow in charge of this project.

The dielectrics fellowship has as its general objective the development of improved insulating materials and processes for application to equipment of Westinghouse manufacture, and it brings the facilities of Mellon Institute into co-operation with those of the Westinghouse Research Laboratories at East Pittsburgh in insulation research.

•

Adds Three New Offices

In line with its plans to continue strengthening its distribution facilities, the Bridgeport Brass Company has opened up three new branch offices during the past few months—Atlanta, Ga.; Milwaukee, Wis.; Pittsburgh, Pa.

•

Texas Energy Consumption

Reports to the University of Texas Bureau of Business Research from sixteen large power companies show total consumption of 187,105,000 kw.-hr. in December, a decline of 2.2 per cent from November, but an increase of 12.3 per cent over December, 1936. For the entire year 1937 consumption was 17.6 per cent greater than during the preceding year.

•

Wishes to Sell Facilities

Being unable to secure a renewal of its franchise, Union Public Service Company has negotiated for the sale to the city of Flandreau, S. D., of its distribution system and real property in that city. An offer has been made by the city and accepted by the company to buy the property. The company estimates the cost of the property to be sold at $167,945 and the depreciated value at $104,670. The consideration to be paid by the city is $77,500.

•

Tampa Electric Wins Prize

Tampa Electric Company's float was judged the grand prize winner in the recent Gasparilla Day parade and the company was awarded a cup.

A POLE-SETTING UNIT FOR A TWO-MAN CREW

WE HAVE SCALED DOWN OUR STANDARD HEAVY-DUTY LIGHT AND POWER SERVICE BODY TO A NEW BANTAM-WEIGHT LINE CONSTRUCTION UNIT. It is similarly equipped with pole setting equipment and provisions for carrying ladders, tamps, shovels and tools.

THE DPL 102 BODY is a small light unit of all-metal construction. It is equipped with a special light-weight derrick with telescoping side legs. A cable takes the tension of the middle leg replacing the two upper middle sections. Our new SERIES 75 CB VACUUM CLUTCH WINCH is used with the assembly.

A light flexible unit of this type is ECONOMICAL FOR RURAL AND SUBURBAN CONSTRUCTION AND MAINTENANCE WORK. The heavier equipment with a large crew is retained at general installation work while two men with this unit service out-of-the-way places.

The body is 102 inches long and is mounted on a standard short wheelbase chassis. The body proper weighs 1280 pounds and the derrick 240 pounds. The total weight including jacks, winch and power take-off is slightly over 2000 pounds. It is equipped with a sliding metal roof, a rubber goods box and a rear platform.

THE AMERICAN COACH & BODY CO.
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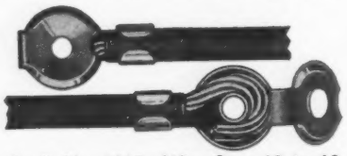

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. . . COMPLETE LISTS COVERING INDUSTRY'S MAJOR MARKETS

Sales Opportunities

LOS ANGELES, CALIF.—Los Angeles Water and Power Bureau, 207 South Broadway, has plans under way for new two-story indoor power substation and distributing station on San Vicente Boulevard, 51x122 feet, estimated to cost about $215,000, with equipment. Also, will build a power substation and distributing station, 50x147 feet, on North La Cienega Street, to cost about $140,000 with equipment. A new underground headquarters building will be built at First and Boylston Streets, consisting of four one and multi-story units for cable department, shops and offices, and garage and warehouse building, estimated to cost $568,000, with equipment. All projects noted are scheduled to be carried out in 1938.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for 6000-kw. turbo-alternator unit, condenser and auxiliary equipment for local navy yard; also, for motor-driven centrifugal pump and accessories, with piping system, for same yard (Specifications 8646).

PEKIN, ILL.—Corn Products Refining Company, 17 Battery Place, New York, N. Y., plans installation of motors and controls, conveyors and other equipment in new addition to corn oil refinery at Pekin. Cost about $275,000. Plans and specifications being prepared by company engineer at Chicago, Ill., office, 333 North Michigan Avenue.

SHREVEPORT, LA.—Southwestern Gas & Electric Company plans extensions in underground conduit system in downtown district, totaling about 15 city blocks. Cost about $175,000. Company also has plans under way for new 1500-kv. automatic power substation on local site. Cost approximately $35,000, including transformers and other equipment. Work will be carried out in connection with 1938 expansion and improvement program.

SPRINGFIELD, MASS.—Commanding Officer, Ordnance Department, Springfield Armory, receives bids until February 23 for one 10-kw., d.c. exciter unit (Circular 148).

LOS ANGELES, CALIF.—Standard Battery Separator Company, 2446 East Fifty-third Street, plans installation of motors and controls, regulators, conveyors and other equipment in new multi-unit plant on Shiela Street, Bandini district. Cost about $100,000. William J. Moran, 1011 South Fremont Avenue, Alhambra, Calif., is engineer.

DECATUR, ALA.—Will take bids soon for new municipal electrical distribution system, including power substation and transmission line connection with TVA system for power supply. Cost about $360,000. Financing has been arranged through Federal aid. T. M. Francis and Paul S. Haley, Brown-Marx Building, Birmingham, Ala., are consulting engineers.

PORT ARTHUR, TEX.—Gulf Oil Corporation, Gulf Building, Pittsburgh, Pa., plans installation of motors and controls, conveyors, electric-operated pumping machinery and other equipment in connection with expansion and improvements in oil refinery at Port Arthur. Cost over $1,000,000.

BLAIR, NEB.—Nebraska Power Company, Omaha, Neb., plans extensions in transmission lines in vicinity of Blair and Hooper, Neb. Application has been made for permission.

GREENVILLE, MISS.—Arkansas Power & Light Company, Pine Bluff, Ark., plans transmission line over Leland Neck Cut-off, Mississippi River, near Greenville, with span of about 6000 feet, to be supported by 560-foot steel towers. Application has been made for permission.

HOOD RIVER, ORE.—Hood River Apple Growers' Association, Hood River, plans installation of motors and controls, conveyors and other equipment in connection with rebuilding of portion of four-story packing plant, recently destroyed by fire. Loss estimated at $125,000.

PARAGOULD, ARK.—Is arranging for a special election in 60 to 90 days to approve bond issue of $100,000 for proposed municipal electric power plant, on which work will be carried out closely following. Cost about $190,000, remainder of fund to be secured through Federal grant.

LOS ANGELES, CALIF.—Plans installation of ornamental street-lighting system on part of Santa Barbara Avenue and Crenshaw Boulevard. Proposed to ask bids at early date.

BROOKLYN, N. Y.—Signal Corps Procurement District, United States Army, Army Base, Fifty-eighth Street and First Avenue, receives bids until February 18 for 192,200 feet of cable and 123 reels (Circular 116); also, at same time, for 55 to 165 dynamotor units and spare parts (Circular 114); until February 21 for a quantity of transmitting apparatus (Circular 117).

CINCINNATI, OHIO—Antonio Palazzolo & Company, 712 Central Avenue, food products, plan installation of motors and controls, conveyors, electric hoists and other equipment in new six-story food products manufacturing and bulk distributing plant at 2009 Gilbert Avenue, 100x100 feet. Cost over $125,000, with equipment. Carlton, Frankenberger & Batson, 4122 Davis Lane, are architects.

GENOA, W. VA.—Appalachian Electric Power Company, Roanoke, Va., plans new transmission line from Echo to Genoa, Wayne County, about 12 miles. Surveys have been authorized.

OAKLAND, CALIF.—Pacific Gas & Electric Company, San Francisco, Calif., has filed plans for extensions and improvements in power substation at First and Grove Streets, Oakland, to include installation of additional equipment. Cost over $75,000. Work is scheduled to begin at once.

AUGUSTA, GA.—Plans installation of beacon lighting system at municipal airport, in connection with extensions and improvements in hangars and other structures to cost about $250,000. Fund is being secured through Federal aid.

•

Manufacturers' Sales Show 27 per Cent Gain in 1937

Manufacturers' sales of electrical machinery, apparatus and supplies during 1937 amounted to $269,815,000, as against $212,145,000 in 1936, an increase of 27 per cent, according to figures reported by the Department of Commerce.

Sales for December, 1937, totaled $20,844,000, an increase of 8.8 per cent over November and of 9.7 per cent over December, 1936, as reported to the department by fifteen firms.

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A tough, Strong, Light, Versatile, Insulating Material

Tough as horn. Almost as strong as Iron. Lighter than Aluminum. Adaptable as brass. These may seem like strong statements to make about any ONE material. Nevertheless they are true! DIAMOND VULCANIZED FIBRE offers you all these properties *plus* good electrical insulating properties. Made in sheets, rods and tubes, all readily fabricated, DIAMOND VULCANIZED FIBRE is adaptable to many mechanical, electrical and thermal insulating parts.

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DIAMOND STATE FIBRE CO. OF CANADA LIMITED

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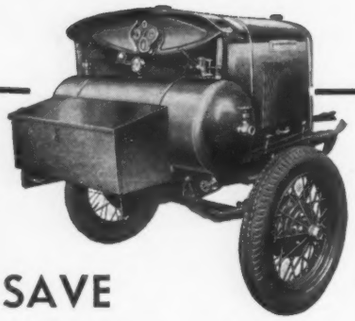

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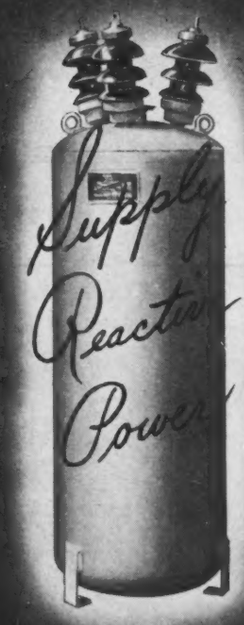

PRODUCTS PROTECTION CORPORATION
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The Safety Car Heating and Lighting Co.
230 Park Avenue New York, N. Y.

Asks Definition for Utilization Factor

[*Continued from page 43*]

data comparative with these items and also have been unable to arrive at the figures given in the table from the information contained therein.

L. M. GROW,
Superintendent Southwestern Public Service Co., Amarillo, Tex.

[In the Steam Station Cost Survey we asked for the number of employees per shift. This we multiplied by three. Generally, however, the reply gave the total number of employees per day. Either total was then divided by 1,000 and stated in the tabulation the "employees per 1,000 kw. per day."

The annual "plant factor" is defined by American Standards Association as "the ratio of the average load on the plant for the period of time considered, to the aggregate rating of all the generating equipment installed in the plant."

Likewise the annual "utilization factor" (A.S.A. definition) is "the ratio of the maximum demand of a system or part of a system to the rated capacity of the system or part of system under consideration."

The tabulated data under these two items was computed in conformity with these standard definitions.

We hope this eliminates any uncertainty you may have encountered and that you will be able to reconcile your own experience with that of comparable plants in the survey. If you find discrepancies I hope you will let us know.—EDITORS.]

•

Item Improperly Credited

To the Editor of ELECTRICAL WORLD:

Through some error I was given credit for authorship of Case Study No. 6, "Brick Company Saves Heat Formerly Wasted," on page 70 of the November 6 industrial power feature of ELECTRICAL WORLD. This article was written and contributed by E. E. Schwalm of our company, who was our representative on this particular job.

FORD BATES,
Asst. Commercial Sales Manager
Nebraska Power Company,
Omaha, Neb.

•

Transfers Office to N. Y.

Brown Company, Portland, Me., announces that the executive offices of its tubular products division, which includes all Bermico fiber products, has been transferred from Portland to the company's offices in the Graybar Building, New York.

RELIABILITY
Electrical and Mechanical
J-D PORCELAIN INSULATORS

J-D Porcelain Insulators—Suspension Switch and one-piece, high-voltage pin types—combine high mechanical and electrical strength with reliability. Also Strain Insulators, Bushings, Special Shapes and a complete line of Insulator Hardware.

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BOOK REVIEWS

Business Administration for Engineers

By C. Francis Harding and Donald T. Canfield. Published by McGraw-Hill Book Company, 330 W. 42d Street, New York, N. Y. 637 pages. Price, $5.

While framed as a university text, this book is peculiarly appropriate for mature engineers because it deals with the corporate superstructure of engineering business to a depth and scope not covered by the curriculum to which today's practicing engineers were exposed. Early chapters deal with the securities of corporations and those who hold them but intrust management to directors and executives to be administered through organized procedure. Corporate assimilations are shown to have led to investment trusts and holding companies, meanwhile having precipitated appraisal and valuations as well as focusing attention to deterioration and consequent rehabilitation. Here, as in the later unfolding of the theme, the treatment is ample, largely specific in illustrations, and peculiarly geared to the needs of the engineer who finds he would be more secure if he knew the techniques of business structure and administration.

The mathematical aspects of capital, interest amortization, discounts, present worth, etc., take four chapters, and then comes a series of sections on accounting and allocations. The various rewards of business operation in terms of gross, net and distribution are distinctive in that the authors adopt the term "yield" instead of "return" as being more rigorous. Principles of economic selection are accorded a chapter, as are a discussion of the terminology of electrical distribution factors (such as diversity, load, plant, utilization and power factors).

Numerous quotations in the book from ELECTRICAL WORLD can be cited in support of the reaction that electrical engineers will find this book a fine induction into the patterns of business structures and into the problems confronting management. However, the fact that the power utility business almost monopolizes the illustrative data in the book should constitute no detraction in the eyes of other engineers, because to a large degree the business principles and practices discussed are basic and virtually universal.

•

Central Stations

By Terrell Croft and revised by George H. Hall. Published by McGraw-Hill Book Company, 330 W. 42d Street. 360 pages, illustrated. Price $3.

"Central Stations" is not as good a name as might be for an elementary treatment of systems for generating and distributing electrical energy whether within an industrial plant or over the whole of one or more states. Much is made of demands and the various factors associated with handling power distribution economically. Circuit characteristics follow, and then the brief but concise descriptions of apparatus used. D.c. and a.c. are accorded equal prominence. Many paragraphs and outmoded illustrations of previous editions have been retained, but, on the contrary, George H. Hall in revising this book of the well-known Croft series has brought certain sections suprisingly up to date for the guidance of none too technical initiates into the making and disposing of electric power.

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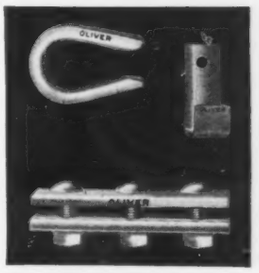
Maximum protection against the constant attacks of the elements is assured by the double-thick coating of zinc spelter applied by the Oliver Special Hot Galvanizing Process. That is why Oliver has been a standard specification among economy-minded transmission line engineers for more than 40 years . . . why Oliver Pole Line Materials deliver the maximum service per dollar invested.



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In Times of Emergency When the Storms Rage and the Lines are Down . . .

. . . and your men must work under tough conditions then they need all the help you can give them . . . National Splicing Sleeves assure the making of the line joints quickly and easily either in the air or on the ground. Once a National Seamless Single Tube Sleeve has been twisted about the conductors you have a splice that is stronger than the wire itself and as tight as a weld.

These sleeves, exact to size, made from best grade material are carried in a size range from 10 B & S to 500,000 C.M. Write for prices and samples.

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As simple in construction as an ordinary indicating meter. The chief difference is that, the Lincoln Demand Meter is time lagged to a large degree, while an ordinary indicating meter is practically instantaneous.

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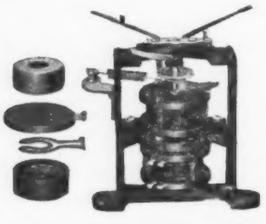

View of actuating element and parts

LINCOLN METER COMPANY
SPRINGFIELD, ILLINOIS

Saves $4,000 Each Year With Purchased Power

[*Continued from page 51*]

was double that for 1935, the year of the change-over, yet the power cost increased only $1,000.

In order that the annual profit from the power change-over can be known the cost information, given in the accompanying table, has been made available by the Manville company.

It is apparent that the actual reduction in the cost of light, heat and power is about $6,000 per year, based on the above comparisons. Since the plant production figures represent dollars of plant payroll, however, and since allowance for variations in hourly rates must be made, the management reports a minimum saving of $3,000 to $4,000 in actual out-of-pocket expense each year by reason of the change to purchased power.

Comparative Cost of Power
Private Plant vs Purchased Power

Year	Major Power Source	Fuel Cost	Labor Cost Boiler & Engine	Purchased Power Cost	Total Plan Exp.
1936	Purchased power..	$3,380	None	$7,340	$11,220
1935	Purchased power..	3,870	$1,800	4,350	10,020
1934	Private plant.....	4,902	2,369	1,967	9,238
1929	Private plant.....	$10,500	$3,000	$5,000	$18,500

Good power factor conditions are maintained in the plant by operating the synchronous motor with over-excited field. Thus a plant power factor of about 90 per cent is obtained during months of normal operation. During heavy production periods power factor averages 80 per cent. With the fifteen-minute integrating demand meter that measures the load for monthly billing purposes the peaks of individual machines are well diversified, resulting in a total rate of approximately 2.2 cents per kilowatt-hour average throughout the year on the two-part schedule of the power company.

•

Frigidaire Offices Open

With arrival in Birmingham of key members of its executive staff, the newly established Alabama and northwest Florida headquarters of Frigidaire Division, General Motors Sales Corporation, has started functioning, L. W. Curl, district manager, has announced.

Practical Measures Keynote Technical Sessions of A.I.E.E.

[*Continued from page 50*]

have not necessarily been synonymous with poor performance.

Rating of welding transformers

Discussers of C. E. Heitman's paper on rating of resistance welding transformers at Wednesday afternoon's welding session seemed in accord on one major point—the nature of the standard adopted for rating welding transformers mattered far less than agreement of all welding manufacturers on some single standard.

From the utility point of view L. W. Clark (Detroit Edison) called attention to the need for keeping the external reactance of the secondary circuit as low as possible, particularly in the larger welding machines, by careful and compact design. Definite savings in welding transformer size, distribution facilities throughout the plant and power demands drawn from the power system could be realized thereby, he said. He pointed out that many of the large present-day seam and projection welders have much higher reaction losses than necessary, resulting in oversize supply equipment all along the line. Money spent in improved design would be repaid many times over in savings in expenditures for transformer capacity and distribution facilities, he believed. On the subject of nameplate rating, Mr. Clark agreed with the author that it was highly desirable, when transformer is part of a complete welding machine, that maximum instantaneous kva. demand be given.

Separate discussion by Messrs. D. I. Bohn and G. S. Benard (Aluminum Company of America) represented the user's point of view. Bohn pointed out the desirability of a dual rating for welding equipment, since he felt it was undesirable to rate the machines on the basis of the transformer alone. Benard called for the inclusion of secondary current on the nameplate of welding equipment rather than kva. as indicating the welding current range that could be expected from the welder in use. One user pointed out the desirability of making data on the resistance and reactions of the transformer secondary available as guide to welding current.

S. M. Humphrey (Taylor-Win-

STERLING

Contributes to PROGRESS!

Twenty-one 8-cylinder Sterling engines, rated 300 horse-power, (400 H.P. under overload), are in continuous service for a major oil company—on pipe line pumps and generator sets.

These engines operate at 900 R.P.M., loaded frequently to over 320 H.P. All units have operated thousands of hours, without stopping for valve grinding or other service attention usually required for engines not so constructed. Previously, similar engines had been in service for four years, with a fine record for continuity and low maintenance—warranting this giant order. These engines are now establishing new records.

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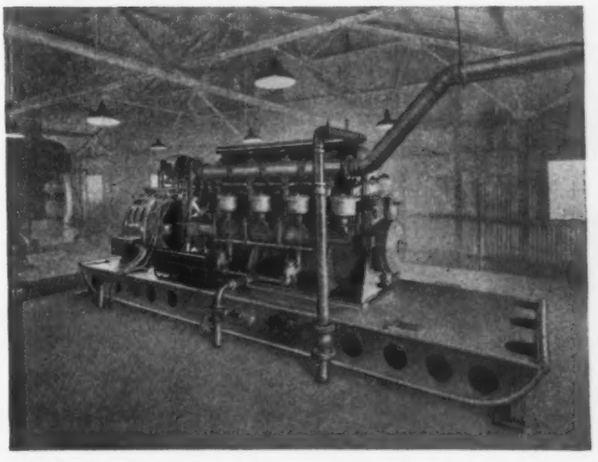
STERLING HIGH DUTY

INTERNAL COMBUSTION ENGINES



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Always use dependable Davey Service

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DAVEY TREE SERVICE

MASTER-LIGHTS

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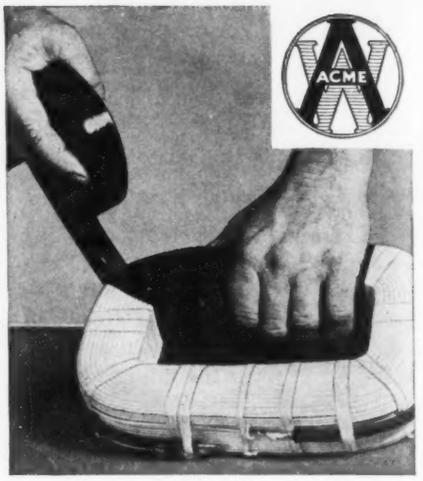
field) in discussing the advisability of standardizing nameplate ratings of transformers on the basis of a 100 per cent duty cycle, as recommended by Mr. Heitman's paper, pointed out that it might give rise to confusion in the minds of those now using equipment rated on the 50 per cent duty cycle basis set up by the American Welder Manufacturers Association. In discussing the suggestion that resistance and reaction value be made available on the nameplate, Humphrey pointed to the difficulty of obtaining accurate data on these quantities in view of the range of terminals used in welder equipment. He agreed with Heitman that the total impedance was to be preferred.

From the control manufacturers' point of view, F. H. Roby (Square D Company) pointed out the desirability of specifying on the nameplate the current that must be controlled. With standardization in terms of current, he pointed out that it would be possible for control manufacturers to prepare curves correlating contactor size, contactor operations per minute and welding current, thus facilitating the specification of the proper contactor for different welders.

L. W. Clark (Detroit Edison), expanding on the report of the resistance welding subcommittee which mentioned increased use of large welders, described a low-reactance bus system recently designed and installed to serve the extremely high-current, low-power factor load of a large welding plant in the Middle West. The main bus section of this system, which serves 18,000 kva. of various size resistance welders, consists of 4-in. standard copper tube surrounding extra heavy 3-in. copper tube, with micarta tubing insulation between. Need for bus supports or outer insulation is avoided by grounding the outer conductor. Branch buses consisted of 2-in. tube surrounding 1¼-in. extra-heavy tube. The main bus carries 1,000 amp. of 40 per cent power factor, 440-volt welding current a distance of 800 ft. with a voltage drop of 1 per cent. Branch buses can transmit the same current 300 ft. with only 1 per cent drop also, it was said.

Transportation modernization pays

Enthusiasm ran high at the two transportation sessions on Monday,



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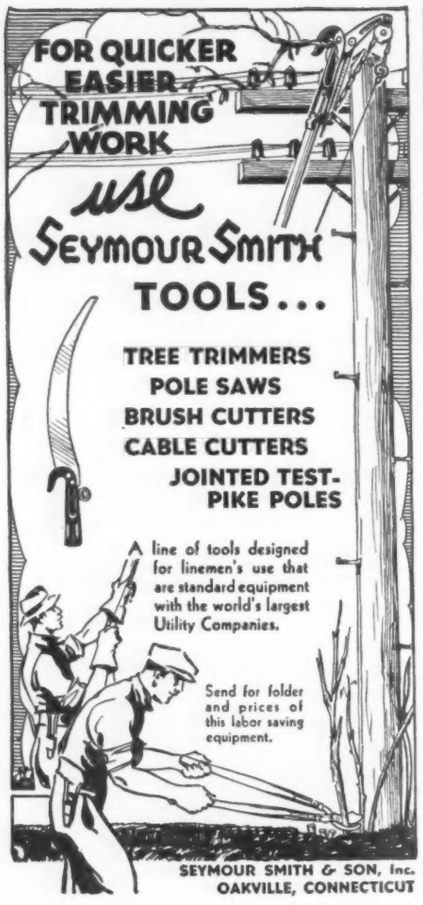
at which the re-energized committee under G. I. Wright (Westinghouse) sponsored a discussion of both rail and trackless forms of urban transportation. No one hearing the discussion of the PCC car, the trackless trolley and the all-service vehicle could come away from the sessions subscribing to the popular dictum that the doom of the electrically propelled vehicle has been sealed by the advent of the internal combustion engined car. Some index of the attendance and the interest can be gained from the fact that well over 200 attended the noon luncheon at which 25 had been tacitly promised to the Engineers Club. That modern urban traction as exemplified by the three tools named is here to stay was the major indication elicited from the sessions.

President C. W. Chase of Indianapolis Railways related that that system six years ago was bankrupt in a financial, personnel and public acceptance sense. Something drastic had to be done. A courageous ten-year modernization program budgeting $9,000,000 has, however, been virtually completed with $8,000,000 of borrowed money in a six-year period. New trackless trolleys (152 of them) have been bringing in 20 per cent more gross than alternative predecessor services. The 90 new-style street cars are doing 10 to 12 per cent better. On the whole, a transformed public attitude, higher schedule speeds and an increase of 111 per cent in net revenue are the tangible results of a determination to bring urban transportation to a plane of profitable competition with the private automobile.

Word was sent by E. J. McIlraith (Chicago Surface Lines) that for heavier traffic conditions the electric vehicles (street cars or trackless trolleys) are more economical and, being dependent on central station energy, offer the opportunity to avoid dependence on gasoline or oil, which may in the future be less available and consequently more costly. Anyhow, they have the marked advantage of fumeless operation, better heat, better light, better ventilation, less noise, better reliability and larger capacity.

More than 500 of the new Presidents' Conference Committee cars are in use in seven cities, said Charles Gordon, managing director American Transit Association, in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presenting Dr. C. F. Hirshfeld's paper reviewing the comprehensive research on which the revolutionary design was based. High, smooth acceleration (4.75 m.p.h. per second) are obtainable and braking is threefold —wheel, dynamic and magnetic track—with values up to 8 or 9 m.p.h. per second. Modernized lighting provides 15 ft.-candles, where it had commonly been 2 to 5 ft.-candles.

Trolley coaches in general, said C. M. Davis (General Electric), are indicated where headways are between two or three and fifteen minutes on lines and where passengers per hour are 6,000 or 8,000.

Startling reductions (2,185 down to 700 lb.) were made in the 55-hp. motor designed for the PCC car, said S. B. Cooper (Westinghouse), and this was largely due to the use of high-temperature insulation, improved bearings and commutator design for higher rotational speeds. The availability of glass tape insulation holds great promise for further improvement in the design of traction motors. Meanwhile, lower cost energy has permitted reversion to rheostatic acceleration (97 taps) for smooth and rapid acquisition of speed by the PCC car. Trackless trolleys, due to the cushioning torque effect of rubber tires, can be smoothly accelerated on thirteen to fifteen notches. There are now 1,500 trackless trolleys on order or in service, said Cooper, and the latest motors have been brought down to 8.8 lb. per horsepower.

Quality of the PCC cars was attested by T. Fitzgerald (Pittsburgh Railways) when he reported that they have given less mechanical and electrical trouble than any new type of car ever introduced on the system. He feels that, because of their resilient wheels, they will hold the rails longer in the sense that they re-establish the prestige of rail operation. Also, he expects that the new PCC car will create economies in power consumption, track maintenance and car maintenance. With it, patronage increases from 5 to 11 per cent under comparable conditions. On the whole, it constitutes an adequate answer to the accusation of street railway obsolescence, Fitzgerald asserted.

Trackless trolley, all-service vehicles

Boston Elevated (by President Edward Dana) reported advantageous results from its 49 trackless trolleys as feeders to the subway and elevated systems. The complexity of the double trolley has ceased to be the bugaboo it once was and Mr. Dana sees a growing tendency to adopt this form of vehicle for moderate headways and medium traffic density. Additional lines are contemplated for Boston and its environs. Manager Sawyer of Dayton (Peoples Railway), who has a fleet of trackless vehicles, reported net earnings before depreciation of 10.8 cents per car-mile and energy consumption of 2.99 kw.-hr. per car-mile. They positively improve relations with all the traveling public.

Portland is another of the 34 cities having trackless trolleys and J. H. Polhemus (executive vice-president Portland Electric Power Company) said their 140 units carried more than 15,000,000 riders over 3,288,647 coach-miles with an operation expense of 24.27 cents per coach-mile and a power consumption of 4.04 kw.-hr. (40 passengers). Henceforth trackless trolleys will supersede trolley cars whenever rails are due for replacement, he said.

The largest single fleet of modernized urban transportation units consists of the 500 all-service vehicles of Public Service Co-ordinated Transit. Their sponsor, Martin Schreiber, said they had carried some half a billion riders and have operated 13,000,000 miles per year. That they can function in congested traffic is attested by the passage of 821 of them per hour at Newark's busiest downtown intersection. Electric propulsion (whether by overhead trolley or gas-electric or oil-electric) is the definitely confirmed practice on Public Service. Schreiber calls them the universal vehicle for heavy density urban conditions, interurban, inter-metropolitan chartered service, detours anywhere, garage trips, tunnel operation, storm conditions and comfortable changeover from rail operation. The 27 oil-electric vehicles included above have disproved all the allegations raised against them.

Electronic motor speed control

Three types of electronic speed control of motors were mentioned in the Tuesday morning paper of Alexanderson, Willis and Edwards—synchronous motor using thyratron as a commutator (ELECTRICAL WORLD, July 6, 1935), wound-rotor induction

motor using a rectifier and G.E. motor on secondary winding, and a phase-controlled rectifier supplying the d.c. motor from a.c. power. Alexanderson (General Electric), in expanding the paper during discussion, brought out the prediction that 4,500-hp. motors would be speed controlled by electronic means when tubes carrying 200-amp. currents became available and advances in motor technology allowed use of voltages of the order of 4,600 in indirection motor secondary winding. W. R. Keen (also General Electric) found electronic speed control schemes limited by economy to applications of special nature. Reasonable economies, he said, were promised with these designs for jobs where d.c. was not available. He found that steam was equally adaptable to the self-contained designs in machine tools. J. H. Cox (Westinghouse) pointed out that 350-hp. drives using electronic speed controls have been applied and that a 1,250-hp. drive was being developed at the present time. Mr. Cox found that ignitions lend themselves to this type of application and in present sizes available allow use in controlling the speed of motors up to 1,500 hp.

Thyratron motor at Logan

Experience with the first thyratron motor installation, a synchronous motor with 18 thyratrons as a commutator (ELECTRICAL WORLD, July 6, 1935), in use as an induced draft fan drive at the Logan plant of the American Gas & Electric Company, was discussed in a paper by A. H. Beiler. Discussing Beiler's paper, Philip Sporn, vice-president of the company, stated that operating experience cited in the paper shows that everything expected in the way of performance at the time the application was made has been attained. Short life, one weakness of the electron tube, strikingly brought out by data presented in this paper, is attributed to lack of experience in building tubes, particularly those carrying heavy currents, said Mr. Sporn. Cost reduction, life and reliability comparable to data obtained by other means are contingent upon quantity use of these tubes by engineers, it was said. Given wider experience, Mr. Sporn felt that there was no reason why this problem in tube application cannot be solved.

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Electrical Equipment for Battery Trucks

[*Continued from page 58*]

The active material of the lead-acid battery is lead peroxide on the positive plate and finely divided, or sponge, lead on the negative plate. The electrolyte in this type of battery is dilute sulphuric acid. Upon discharge, the active material on both plates is changed to lead sulphate, the amount of lead sulphate formed on the plates and the amount of acid lost from the electrolyte being in direct proportion to the ampere-hour discharge. The exact reverse of this takes place during charging. Careful attention must be paid to the purity of the electrolyte in order that this reaction may take place properly.

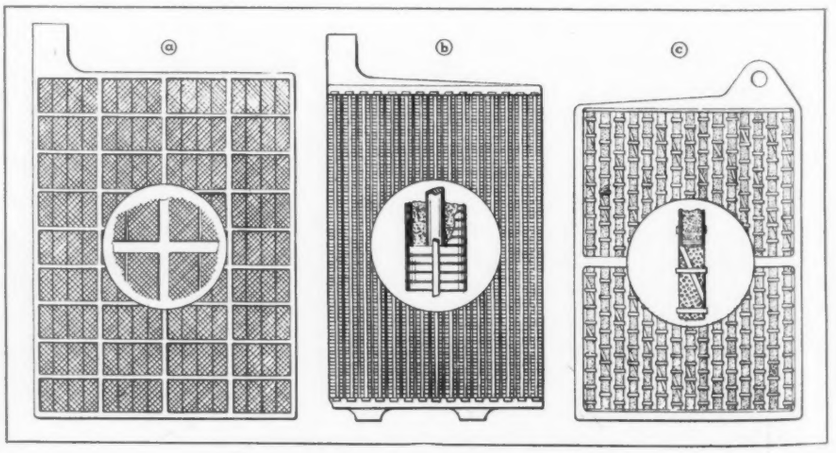
Each battery cell is composed of a number of positive and negative plates, which are separated by spacers of wood, vulcanized rubber or glass fiber, and inclosed in a container which is usually of hard rubber for the acid type and of pressed steel for the alkaline type of battery.

In what is known as pasted plates a grid of cast lead is provided with a large number of square or rectangular spaces, into which the active material is forced under heavy pressure. In one type of lead-acid battery, the "Ironclad," the positive plate consists of a metal frame from which extend a number of parallel metal-conducting rods. Surrounding each rod is a rubber tube which has a large number of horizontal slots to permit access of the electrolyte. Within these rubber tubes, and surrounding the conducting rods, is the active material of the plate. Such a construction necessarily increases the cost of the plates, but, as shown by protracted tests, their active life is materially lengthened.

The nickel-iron-alkaline battery, known as the Edison, differs from the lead-acid type not only in the materials used for the plates and in the character of the electrolyte but in the chemical reaction which takes place under charging and discharging conditions. In this type of battery the electrolyte does not enter into the chemical reactions which occur at the plates, but acts merely as a carrier of oxygen between the plates. On discharge, the oxygen is transferred from the positive to the negative plate, while on charging the action is reversed.

The positive plate of the nickel-iron-alkaline battery consists of a steel frame carrying a number of perforated tubes of thin steel which are filled with alternate layers of nickel hydrate and metallic nickel, in very fine flakes, assembled under high pressure. The negative plates are of nickeled steel having oblong openings, into which are pressed perforated nickel-steel boxes filled with iron oxide. The active elements of this type of battery are nickel peroxide for the positive plate and iron oxide for the negative plate. The electrolyte is a 21 per cent solution of potassium oxide in water, to which is added a small amount of lithium hydroxide.

Batteries are rated on the basis of ampere-hours or the number of ampere-hours they will deliver under specified conditions of temperature, rate of discharge and final voltage, also on the watt-hour capacity, which is the number of watt-hours which they will deliver under specified con-



Representative types of battery plates

(a) Typical pasted plate for lead-acid battery. (b) Ironclad plate (positive) for lead-acid battery. (c) Edison plate (positive) for nickel-iron-alkaline battery.

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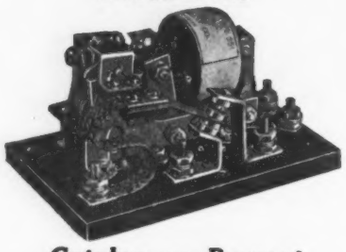

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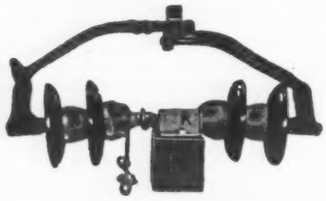

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The average voltage of lead-acid batteries, per cell, on a six-hour discharge rate is about 1.92, with an initial voltage of 2.02 and a final voltage of 1.74. On a five-hour rating, the average voltage of the nickel-iron-alkaline cell is 1.2, with a final of 1.00 volt. Any number of cells may be connected in series to deliver the total voltage required for the operation of the motor, and the acceptable number of cells, of either type, is specified by the truck builder as representing the most desirable equipment for the individual truck with which the battery is to be used.

•

Commission Defers Action on Rural Electric Lines

Nebraska Railway Commission has deferred action on the application of the Cedar-Knox Rural Public Power District to build 178 miles of transmission lines, after hearing objections from one private power and five telephone utilities operating in northeastern Nebraska.

Representatives of the Interstate Power Company of Dubuque asked the commission to confine the district's sale of power to rural customers, maintaining that Interstate already serves municipalities in the proposed area. Commissioners indicated they are without authority to regulate such service areas.

The telephone companies based their objections on the fact that they will be required to modernize their lines to avoid interference from the proposed electric wires.

•

Air Conditions Coaches

Twenty-nine coaches are being air conditioned at the Southern Railway shops in Chattanooga, Tenn., at a cost of approximately $10,000 a coach, James Freeman, assistant general passenger agent of the railroad, stated. Coaches are being rebuilt in that city and elsewhere in order for the Southern to have all its passenger trains air conditioned by May 1.

SEARCHLIGHT SECTION

Continued on pages 135-137

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(Continued on page 136)

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